Mining in British Columbia

1974

Province of
British Columbia
Ministry of
Mines and
Petroleum Resources

101-03508/

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FOREWORD

Since 1973 the Annual Report of the Minister of Mines and Petroleum Resources has been restricted to a report on the activities of the Department and a review of, and statistics on, the mineral and petroleum industries of British Columbia. Technical reports which formally were included in the Annual Report are published separately.

This volume replaces the report on Inspection of Mines by the Chief Inspector. It is primarily an account of the accidents, dangerous occurrences, safety, and operating experience of the mining industry for the year but it also includes the work of the Inspection and Engineering Division which is the office of the Chief Inspector. To preserve continuity, the report follows the format of the previous reports of the Chief Inspector which were published in the Annual Report of the Minister.

Publication has been delayed for administrative and technical reasons.

INTRODUCTION

The Department of Mines was established in British Columbia in 1874 and two years later, owing to the inherent hazards in the coal mining industry that was developing on Vancouver Island, the first *Coal Mines Regulation Act* was passed to safeguard persons employed within this industry. To implement this Act the Inspection Branch was established the following year and became the first agency of the new Department. The first Inspector of Mines was Edward Gawler Prior who subsequently served this Province as Premier and ultimately as Lieutenant Governor.

Twenty years after Mr. Prior's appointment, the first *Metalliferous Mines Regulation Act* was passed. In subsequent years this Act, which became the *Mines Regulation Act* in 1967, and the *Coal Mines Regulation Act* have undergone several revisions and amendments. These changes have not only kept the safety regulations abreast of new developments in mining technology but have also altered the scope of the Acts. Whereas the initial Acts were directed mainly to regulate safe mining conditions and practices with respect to those actively engaged in the industry, the present Acts have been expanded to include the regulation of conditions that may affect the health of persons employed at mines and also the health and safety of the public in certain circumstances where mining activities may adversely affect the public. In addition recent legislation has added regulations requiring that land areas disturbed by mining operations be reclaimed for future use after the minerals being sought have been removed.

Although annual reports have been prepared since 1877 by the Chief Inspector of Mines, 1974 marks the first occasion this report is being presented separately and, in the ensuing account concerning the implementation of the aforementioned Acts is a summary of this year's activities of the staff of the Engineering and Inspection Division. In addition it contains reports of investigation of fatal accidents which occurred at the mines during the year and also summaries of dangerous and (or) unusual occurrences which may or may not have resulted in personal injury. This information is presented in the hope that where an unfortunate incident has occurred in the mining industry those persons reading the detail will be alerted to avoid a recurrence.

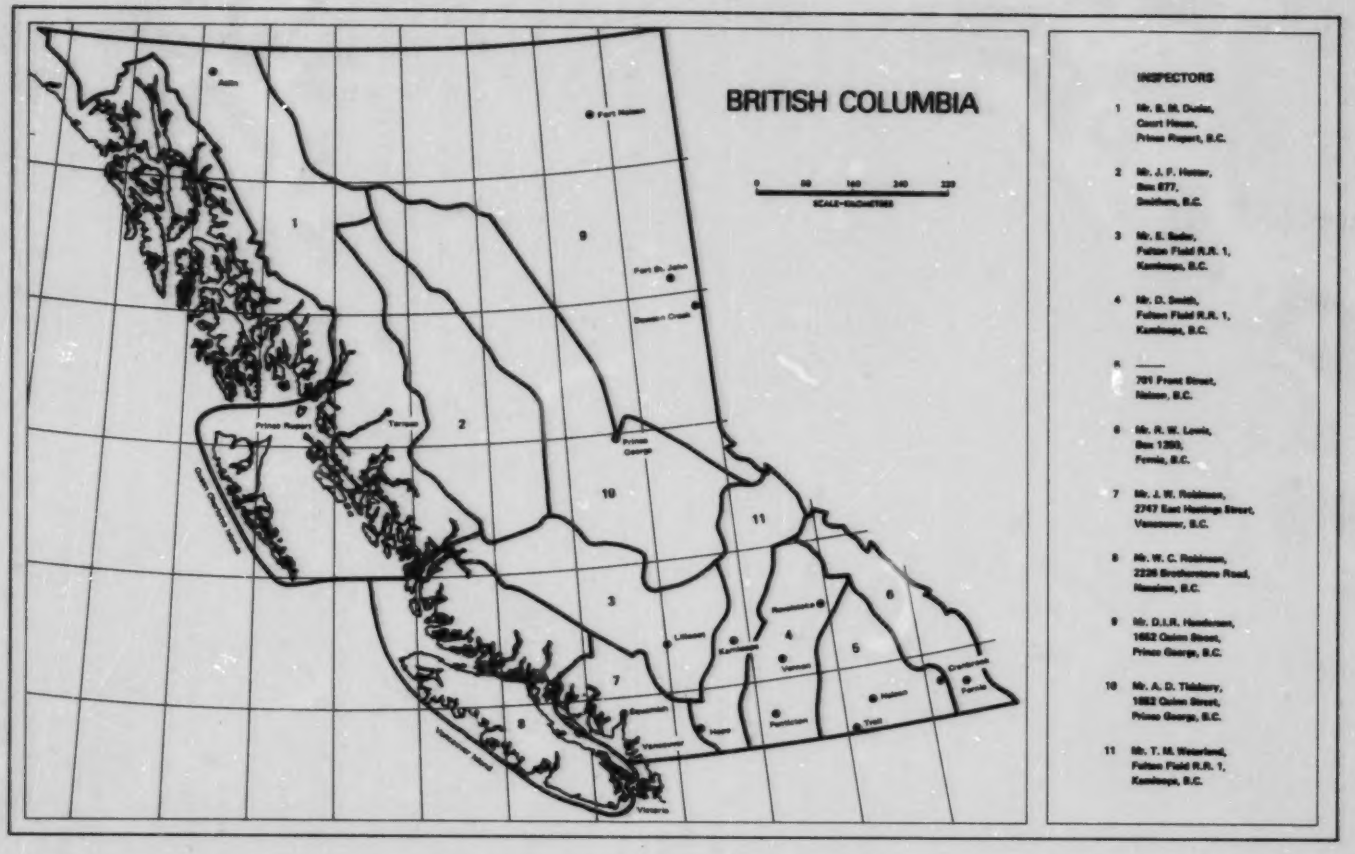
BRITISH COLUMBIA
INSPECTORS
1 Mr. S. M. Dube, Court House, Prince Rupert, B.C.
2 Mr. J. F. Hester, Box 677, Smithers, B.C.
3 Mr. E. Bebe, Fulton Field R.R. 1, Kamloops, B.C.
4 Mr. D. Smith, Fulton Field R.R. 1, Kamloops, B.C.
5 ——— 701 Front Street, Nelson, B.C.
6 Mr. R. W. Lewis, Box 1269, Fernie, B.C.
7 Mr. J. W. Robinson, 2747 East Hastings Street, Vancouver, B.C.
8 Mr. W. C. Robinson, 2328 Brotherstone Road, Nanaimo, B.C.
9 Mr. D.I.R. Henderson, 1652 Quinn Street, Prince George, B.C.
10 Mr. A. D. Tibbetry, 1652 Quinn Street, Prince George, B.C.
11 Mr. T. M. Waterland, Fulton Field R.R. 1, Kamloops, B.C.
Fort Nelson
Fort St. John
Dawson Creek
Prince George
Prince Rupert
Terrace
Queen Charlotte Islands
Vancouver Island
Victoria
Kamloops
Vernon
Penticton
Nelson
Trail
Cranbrook
Fernie
Revelstoke
Lillooet
Chilliwack
Hope
Squamish
Vancouver

Figure 1. Index map showing inspectoral districts.

STAFF

The following lists indicate the location and duties of the staff of this Division on December 31, 1974. Except for the senior staff in Victoria, the Inspectors examine coal mines, metal mines, and quarries in the districts as indicated on Figure 1. They also may examine prospects, mining properties, road and trails, and carry out special investigations under the *Mineral Act*. The Environmental Control Inspectors conduct dust, ventilation, and noise surveys at all mines and quarries and, where necessary, make recommendations to improve environmental conditions. The Senior Inspector, Mining Roads, supervises the roads and trails, and the prospectors' assistance programs. The Senior Inspector, Reclamation, administers the reclamation sections of the *Coal Mines Regulation Act* and the *Mines Regulation Act*. The Senior Inspector, Coal, has additional duties as mining advisor to the Securities Commission. Mine-rescue training is completed under the direction of the Co-ordinators, Rescue Training, for the areas in which their stations are located.

INSPECTORS AND RESIDENT ENGINEERS

J. W. Peck, Chief Inspector ..... Victoria
J. E. Merrett, Deputy Chief Inspector of Mines ..... Victoria
V. E. Dawson, Senior Inspector, Electrical-Mechanical ..... Victoria
A.R.C. James, Senior Inspector, Coal; Aid to Securities ..... Victoria
P. E. Olson, Senior Inspector, Mining-roads ..... Victoria
J. Cartwright, Inspector, Electrical ..... Victoria
J. D. McDonald, Senior Inspector, Reclamation ..... Victoria
G. J. Lee, Senior Co-ordinator, Rescue Training ..... Victoria
S. Elias, Senior Inspector, Environmental Control ..... Vancouver
G. V. Lewis, Inspector, Environmental Control ..... Vancouver
J. W. Robinson, Inspector and Resident Engineer ..... Vancouver
W. C. Robinson, Inspector and Resident Engineer ..... Nanaimo
R. W. Lewis, Inspector and Resident Engineer ..... Fernie
David Smith, Inspector and Resident Engineer ..... Kamloops
E. Sadar, Inspector and Resident Engineer ..... Kamloops
T. M. Waterland, Inspector and Resident Engineer ..... Kamloops
R. Heistad, Inspector-Technician, Mechanical ..... Kamloops
S. M. Dudas, Inspector and Resident Engineer ..... Prince Rupert
———, Inspector and Resident Engineer ..... Nelson
D.I.R. Henderson, Inspector and Resident Engineer ..... Prince George
A. D. Tidsbury, Inspector and Resident Engineer ..... Prince George
J. F. Hutter, Inspector and Resident Engineer ..... Smithers
W. H. Childress, Inspector-Technician ..... Vancouver

CO–ORDINATORS, MINE–RESCUE STATIONS

E. C. Ingham, Co-ordinator, Rescue Training ..... Prince George
———, Co-ordinator, Rescue Training ..... Nelson
A. Littler, Co-ordinator, Rescue Training ..... Fernie
T. H. Robertson, Co-ordinator, Rescue Training ..... Nanaimo
J. A. Thomson, Co-ordinator, Rescue Training ..... Kamloops
J.E.A. Lovestrom, Co-ordinator, Rescue Training ..... Smithers

STAFF CHANGES

In June, Gordon V. Lewis joined the Vancouver office staff as Inspector, Environmental Control. At the end of September, Harry Bapty retired as Senior Inspector, Mining-roads, after 11 years' service with the Department and was replaced by P. E. Olson who transferred from the office of the Inspector and Resident Engineer in Nelson. On the same date, October 1, G. J. Lee was appointed Senior Co-ordinator, Rescue Training and transferred from Nelson to Victoria. Also on the same date W. H. Childress transferred from the Noise Surveys section of Environmental Control to the regular inspection staff at the Vancouver office. At the beginning of November, John Dick resigned as Reclamation Inspector at the Victoria office. On November 6, J.E.A. Lovestrom joined the staff as Co-ordinator, Rescue Training at the Smithers office.

BOARDS OF EXAMINERS

BOARD OF EXAMINERS
(COAL MINES REGULATION ACT)

J. W. Peck, Chairman ..... Victoria
A.R.C. James, member ..... Victoria
R. W. Lewis, member ..... Fernie

The Board conducts written and practical examinations for the various certificates of competency under the provisions of sections 25 and 26 of the *Coal Mines Regulation Act,* and advises the Minister on the granting of interchange certificates under this Act. Under the new Act the Board is no longer responsible for issuing coal miners' certificates; these are now issued after examination by the District Inspector.

BOARD OF EXAMINERS
(MINES REGULATION ACT)

J. E. Merrett, Chairman ..... Victoria
A.R.C. James, member ..... Victoria
W. C. Robinson, member ..... Nanaimo

The Board conducts written examinations in various mining centres for applicants for underground and surface shiftboss certificates. The Board is also empowered to grant provisional certificates without examination and under such conditions as the Board considers necessary.

FATAL ACCIDENTS

Twelve fatalities occurred within the British Columbia mining industry in 1974. Of these, one occurred in an underground coal mine, one in a shaft at a placer mine, one at a

granite quarry, and the remainder were at metal mines. Of the nine fatalities at metal mines, six occurred underground, two in concentrators, and one at an open pit. The total of 12 represents an increase of five over the seven which occurred in 1973, but is less than the past 10-year average of 17, in which is included the 26 casualties incurred in the Granduc avalanche in 1965.

The following table shows the mines at which fatal accidents occurred in 1974, with comparative figures for 1973:

Company	Location	Number of Fatal Accidents 1974	1973
Bethlehem Copper Corporation	Ashcroft	1	–
Bordignon Masonry	Nelson Island	1	–
Brenda Mines Ltd.	Peachland	–	1
Churchill Copper Corporation Ltd.	Fort Nelson	1	–
Giant Mascot Mines Limited	Choate	–	1
Granduc Operating Company	Stewart	1	–
Granges Exploration Aktiebolag	50 miles southwest of Houston	–	1
Granisle Copper Limited	Granisle	–	1
Kaiser Resources Ltd.–			
Balmer Hydraulic	Michel	1	–
Harmer Pit	Harmer Ridge	–	1
Lockie Creek Placer	Tulameen	1	–
Noranda Exploration Company, Limited	Nanika River	–	1
Reeves MacDonald Mines Limited	Remac	1	–
Similkameen Mining Company Limited	Princeton	–	1
Utah Mines Ltd.	Port Hardy	2	–
Western Mines Limited	Myra Falls	3	–
TOTALS		12	7

The following table classifies fatalities as to cause and location:

Cause	Number	Coal Mines		Mines Other than Coal	
		Surface	Underground	Surface	Underground
Asphyxia (gas or lack of oxygen)	2	–	–	–	2
Buried in muck	1	–	–	–	1
Caught in machinery	1	–	–	1	–
Explosives	2	–	–	1	1
Fall of ground	3	–	1	–	2
Fall of persons	1	–	–	1	–
Run over by vehicle	2	–	–	1	1
TOTALS	12	–	1	4	7

A chronological description of each accident follows:

Gino Gazzola, aged 26 years, married, and employed as a blaster by Bordignon Masonry Ltd., at their Nelson Island quarry, was almost instantly killed on January 25, 1974,

when struck in the chest by a large piece of fly rock originating from a blast initiated by the deceased.

Gazzola and a partner were preparing a site for the installation of a crane and had drilled two holes about 2½ to 3 feet in depth into which had been loaded two cartridges of 60 per cent Dupont special gelatin. Gazzola primed the holes with electric blasting caps and, after connecting them up, he retreated to the blasting machine at a point about 120 feet from the holes. Instead of taking cover before blasting he remained in the open and detonated the holes. He was almost immediately struck in the chest with a piece of granite rock weighing 25 to 30 pounds. The impact broke his arm and made a cavity in his chest.

Investigation indicated that although the deceased had worked underground as a miner's helper for six or seven years, his knowledge of blasting procedures was limited. The owners were unaware of these limitations.

At the inquest held in Sechelt on February 14, the jury returned the following verdict:

> 'Gino Gazzola died at approximately 4.00 p.m., at Quarry Bay, Nelson Island, Province of British Columbia, by being struck by a piece of fly rock coming from a blast detonated by the deceased.
>
> 'Recommendations:
>
> (1) The deceased was careless in not taking cover.
> (2) We, the Jury, recommend the company practice safer handling of explosives during blasting operations.'

Robert Rysak, aged 20 years, single, and employed as a mill man by Utah Mines Ltd. at Island Copper mine, died on January 31, 1974, from injuries received when caught between the first return idler pulley and the coarse tripper conveyor in the screening tower.

At about 6.20 p.m., Rysak left the tripper gallery shack after having coffee. He was not seen again until 8.10 p.m. when his replacement found him caught between the belt and the pulley, the top of which is 68 inches above the floor on which Rysak was standing. Rysak's arms were over the pulley and his head forced backward under the belt. On finding Rysak the other workman endeavoured to stop the belt, using the emergency trip cord which did not appear to function, so he called another workman on an intercom system and had the belt stopped. On being removed Rysak was taken to the doctor and was pronounced dead. The autopsy indicated death was due to asphyxia attributed to aspiration of blood and compression of chest.

Although there were no witnesses, the investigation indicated the deceased had attempted to clean off the return pulley with the aid of a long-handled flat-mouthed shovel. It is believed the shovel became caught between the belt and idler pulley, and that the deceased had failed to release it before he himself was drawn into the nip point. This act would have been contrary to established operating instructions, which require belts to be stopped before pulleys are cleaned.

At the inquest held in Port Hardy on March 11, 1974, the following verdict was brought in by the jury:

> 'We, the Jury, having been duly empanelled, find that Robert Rysak of Utah Mines Bunk House, aged 20 years, died on the 31st of January 1974 as a result of asphyxia. We find that this death was unnatural and that it was accidental by being drawn through the return roller of a conveyer belt by the shovel he was using to clean the roller, while the belt was in motion. We attach no blame to any person in connection with the death.
>
> 'We recommend that:
>
> (1) Conveyors that are low enough to pose a hazard to persons walking under them should be guarded by an appropriate screen and/or fence with a danger sign on it.
> (2) Safety tripper on the belt should be checked weekly on the regular maintenance shut-down.'

The District Inspector advised that the recommendations of the jury were concurred with, and that the suggested guarding, which had been recommended earlier, was done shortly after the accident. A chain was strung to dissuade persons from entering the area beneath the conveyor and warning signs posted. It was agreed that periodic testing (checking effectiveness) of trip-wires be carried out.

David Larry Braun, aged 34 years, married, and employed as a welder by Bethlehem Copper Corporation, at their Highland Valley concentrator, died on February 22, 1974, as a result of head injuries. Braun and four other workmen were engaged in removing the feed chute to No. 2 rod mill.

The lower section of the chute had been successfully removed but after the upper section was unbolted and the overhead crane was used to lift it, it was found a metal scab had been welded over the joint between the chute and the platform. Another workman commenced burning off the scab with an oxyacetylene torch and the upper chute section was barred, but did not release. Braun then replaced the other man and completed the cutting. The chute released suddenly, rocked violently, and Braun slid out head first and fell about 6 feet to the floor below.

At the inquest held at Logan Lake on March 11, the jury came to the following conclusion:

> 'We, the jury, having been duly empanelled, find that David Larry Braun of Kamloops, B.C., aged 34 years, died on the 22nd day of February, 1974, as a result of head injuries.
>
> 'We find that the death was unnatural and that it was accidental.
>
> 'We attach no blame to any person in connection with the death.
>
> 'We recommend that, if it is requried for a man to enter a bucket in this type of work, the bucket should be secured properly.'

It is presumed that intent of the recommendation was that the chute section should have been rebolted before the metal scab was removed and we are in concurrence with this suggestion.

Guido Filipuzzi, aged 47 years and employed as a leading coal miner in the Balmer Hydraulic mine of Kaiser Resources Ltd., was instantly killed on March 14 by a fall of coal at his working place.

Filipuzzi and two other miners were working at the face of No. 1 Entry, No. 5 Panel. They were making final preparations prior to the erection of an 18-foot long steel 'I' beam on two wooden cogs or supports at the site of an intended roadway intersection. They had previously erected five parallel steel arches extending from the floor at the west or left side up over the back and to the east side where they were supported with five pairs of wooden posts. The arches were bolted together with steel struts, there being five between each pair of arches. The whole of the peripheral area, extending from left side floor, up the rib and over the top, was completely lagged with planks and any cavities were cogged with wood. The ends of the straight girders were solidly blocked to the roof on the right rib. The remaining task to complete the ground support was the installation of the 'I' beam under the right end of the parallel steel arches and the removal then of the five posts.

For some inexplicable reason the arched section suddenly collapsed. The three men attempted to escape, but Filipuzzi was caught and crushed between the top of a Joy loading machine and the caving material. Had they remained in position it is altogether possible they would have been safe as the five posts remained in position.

It has been suggested the failure was due either to a 'bump' or sudden release of energy from restrained strata, or the presence of water which weakened the over head coal above the supports.

The finding of the jury at the Coroner's Inquest held in Sparwood on April 18, 1974, was as follows:

> 'We, the jury, find that the late Guido Filipuzzi came to his death accidentally on March 14 at approximately 6 p.m. at No. 1 Entry Balmer South Mine near Sparwood, B.C. The approximate location of the accident is shown on drawing 111 - 30 - 1. Cause of Mr. Filipuzzi's death was due to injuries received by a Cave-in at an intersection that was just being started. We the jury recommend that extra-ordinary precautions be taken when starting off intersections.'

In respect to the recommendation it is to be noted that a few days after the accident at a joint meeting with the Inspector, representatives of the workmen, and management, recommendations were made and agreed upon to make more use of hydraulic props and upright steel members supporting the arches during the erection of intersection supports.

James Ernest Smith, aged 42 years, married, and employed as a shiftboss by Western Mines Limited, was killed by a fall of ground in 12K59 stope of the Lynx mine at about 10.30 p.m. on May 3, 1974.

The 12K59 stope is approximately 100 feet long, 8 feet wide, and 7 feet from the floor to back. Because of the sheared nature of the vein, the stope was being mined by cut-and-fill methods with the back rock-bolted and strapped in the working area. On the day of the accident the miner had scaled down any obviously loose ground in the unsupported section of the stope. The supervisor, Mr. Smith, visited the stope and in company with the miner, who was installing rock bolts, examined the unsupported section and discussed the working plan for that area. On the completion of this Mr. Smith was in the process of writing out the '5-point safety check' when about 1,000 pounds of loose rock fell from the stope back and struck the men, both of whom were knocked to the ground. The lights of both men were extinguished and Smith was heard to utter 'Oh My God!'. As soon as the miner relit his light he went for help which arrived in the stope between 5 and 10 minutes after the accident. During the rock fall the miner received a broken nose.

On the arrival of the rescue party, no sign of life could be detected in Mr. Smith, but he was loaded in a stretcher and taken by ambulance to the hospital in Campbell River, where the doctor determined Mr. Smith to be dead on arrival.

The autopsy indicated several injuries but that the direct cause of death was a traumatic rupture of the aorta.

A formal inquiry was held in Campbell River on June 20, 1974, at which the following verdict was brought by the Coroner:

'From the evidence I have heard tonight, I find that James Ernest Smith, aged 42 years, of Cumberland, B.C. died on the 4th day of May, 1974, as a result of injuries received while at work at Western Mines Ltd. situated near Campbell River, Province of British Columbia. The cause of death was the rupture of the aorta and death would have been almost instant. I find this death to be unnatural and accidental with no blame attached to any person or persons.'

Donald William Morley Punshon, aged 23 years and working as a partner at an underground placer mine on Lockie Creek about 4 miles northwest of Tulameen, died of asphyxia from carbon monoxide poisoning on June 30, 1974.

On June 30, Punshon and his partner were dewatering a 50-foot-deep shaft of dimensions 3½ feet by 5 feet. A 2-horsepower, 4-cycle Briggs and Stratton gasoline engine coupled to a centrifugal pump was being used to pump up the water, which at that time was 25 feet below the shaft collar. The pump-motor combination was suspended in the shaft and the suction hose was tied to a ladder. The motor ran out of gasoline and Punshon climbed down the ladder to refill the tank. The motor was restarted but the pump failed to function so Punshon spent about 5 minutes endeavouring to adjust the pump to make it work. He then climbed to the collar and his partner saw him coming out. Almost immediately after he must have fallen over backward into the water as the partner heard the noise and, in going down to investigate, noted Punshon was floating in the water in a three-quarter face down position, and about 50 feet below the collar. The partner climbed to the surface for a rope to pull Punshon out but on returning found Punshon had disappeared. His body was recovered by a grapple the following day.

At the inquiry held by the Coroner on July 1, 1974, in Princeton, he reached the following conclusion:

'It is my opinion that Donald William Morley Punshon came to his death June 30, 1974, at approximately 5.10 p.m., seven miles north of Tulameen, B.C. at Lockie Creek, due to accidental asphyxia by drowning as a result of a fall caused by loss of consciousness, when overcome by carbon monoxide fumes emanating from an Internal Combustion engine operating in a confined mine shaft – an accidental death with ignorance and failure to observe safety procedures on the part of J. Todd and D. Punshon, they being to blame.'

It is to be noted that neither of the partners was apparently aware of the *Mines Regulation Act* and, in particular, section 23, rule 93(a) where the use of internal combustion engines, other than of the diesel type, is prohibited underground.

Douglas Paul Caron, aged 23 years, married, and employed as a repairman at the Island Copper mine of Utah Mines Ltd., died on July 11, 1974, as a result of injuries received when the 1-ton flatbed truck he was operating was crushed when run over by a 120-ton Unit Rig truck.

Shortly after 8.00 a.m. July 10, the mine maintenance foreman directed Caron to replace a bucket tooth on an L-700 Le Tourneau front-end loader in the open pit. Caron obtained a tooth and proceeded to the open pit alone in a flatbed truck. Contrary to pit operating procedures and to the training instructions he received three weeks previously, he drove along the right or blind side of three halted Unit Rig trucks and parked beside and slightly ahead of the third truck which was waiting to proceed to a shovel to be loaded. He then used his radio to call the dispatcher to determine if it was the L-700 loader near the shovel that required a bucket tooth. He did not use the radio to communicate with the production trucks nor was the roof-mounted flashing light operating on his vehicle. However, as he was so close to the Unit Rig truck it is doubtful if the light would have been seen even if it was operating.

As soon as the truck being loaded at the shovel started to leave, the driver of the Unit Rig beside Caron started his vehicle and turned to the right preparatory to backing to the shovel. As the driver was unaware of the flat deck beside him, he drove his truck up over the other vehicle. At this time Caron was fatally injured. The driver of the Unit Rig felt his truck rise on riding up on the flatbed, but presumed he had merely driven over an unblasted toe or a hump. He was advised immediately by radio of the accident by one of the two drivers behind him, both of whom believed there would not have been time to use their radio to avert the accident once the truck started to move.

Mr. Caron was removed to the Port Hardy hospital and thence by plane to Vancouver where he succumbed on July 11.

At the inquest held at the Island Copper mine on October 15, the jury gave the following verdict:

> 'We, the jury, having been duly empanelled, find that Douglas Paul Caron of Port Hardy, aged twenty-three years, died on the eleventh of July, 1974, as a result of being run over by production truck number TKD 1753.
>
> 'We find that this death was unnatural and that it was accidental.
>
> 'We find that Douglas Paul Caron was negligent by parking on the blind side of a production truck.
>
> 'We recommend that all Island Copper employees receive comprehensive instruction and examination in mine traffic movement.'

The Inspector completing the investigation has suggested that, where flashers are supplied on small vehicles, they should be mounted sufficiently high to be apparent to the drivers of production trucks. Also, if it is essential for a light-duty vehicle to enter the pit area, it should be by means of radio dispatch or some other method, under the direction of the pit supervisor or his delegate.

Janos Sipos, aged 47 years, single, and employed as a miner by Western Mines Limited, was killed by a fall of ground in 12R-110 stope of Myra Falls mine at about 12.05 a.m. August 7, 1974.

Sipos and two partners had been installing mill rings at 1104 mill hole in the centre of the stope preparatory to the back-filling cycle for this working place. At mid-shift they stopped for lunch and for this purpose moved to the middle of the west half of the stope, where it was 8 feet wide and 12 feet high. The two other partners positioned themselves under the hangingwall which, at that point, dips 65 degrees south. Sipos sat on the footwall side. At this point the ore in the back of the stope appeared to be fairly well secured with rock bolts and straps. Rock bolts and straps had been used on the lower part of the hangingwall but, on examination, their installation was found to be not entirely satisfactory. After lunch Sipos was resting in a reclining position when, without warning, a mass of rock estimated to weigh about 1½ tons fell out of the hangingwall near the drift back from an area which was not supported by rock bolting. This rock struck Sipos on the chest.

The two partners were not injured. They removed the rock from Sipos and summoned a first-aid man from a nearby working place. Sipos was taken to the surface, placed in an ambulance, and delivered to the Campbell River hospital, where the attending doctor advised that Sipos was dead on arrival.

The investigation of this accident indicated that neither of the three workmen had inspected or scaled their working place after coming on shift.

At the inquest held in Campbell River on November 13 and 20, the jury returned the following verdict:

> 'We, the Jury, having been duly empanelled, find that Janos Sipos, of Western Mines, age 47 years, died on August 7 A.D. 1974, as a result of Intrathoracic Hemorrhage and multiple rib fractures.
>
> 'We find that this death was Unnatural and that it was Accidental. We attach no blame to any person in connection with the death.
>
> 'We find that the cause of death was inadequate rock bolting and strapping and, as a result, we recommend more frequent inspection by the Department

of Mines and stricter enforcement of the Safety rules by the Company and the Union. We also recommend consideration be given to the safety committee for loss of bonus pay while making safety inspections, we feel this would encourage more active participation on the part of the employee.'

This Department agrees that further research should be done in the matter of ground support with the use of rock bolts, but believes that final statement not to be relevant to the purpose of the inquest.

Glen King, aged 18 years, single, and employed as a diamond-drill helper, died on August 15, 1974, from injuries received after being involved in an accident when a Scooptram collided with a Unimog truck in the Granduc mine of Granduc Operating Company.

At about 1.30 p.m. a model 2-B Scooptram rolled backward out of control down the access ramp from 2600 level to 2475 level and collided with a model 411 Unimog carrying five people as it was ascending to 2600 level. Mr. King, who was riding on the Unimog, either jumped off or fell off the vehicle and was found part way under the bucket of the Scooptram when it halted. He was immediately removed from the mine and transported by helicopter to the hospital in Stewart, where he died shortly afterward.

From the investigation of the accident, it was determined that the Scooptram ran out of control because of brake failure. The failure was attributed mainly to the loss of brake fluid through a leak in the left front wheel brake bladder. On closer examination of the vehicle the brake fluid reservoir was found to be empty, the rear drive line universals broken, the drive lines worn, the drive line brake pads somewhat worn and in need of some adjustment, the brake lining worn out on the left front wheel, the left front lining return (tension) springs broken, and the right front brakes wet with oil from a leaky seal.

Earlier in the shift this vehicle was being used to fill up a low spot in the drift in front of the 2475 level pumping station where it hung up on the material it was dumping. Another Scooptram was used to pull it free and it is possible the universal joint on the rear drive line was damaged at this time.

Subsequently this vehicle was being delivered to 2600 level when the operator experienced difficulties in climbing the 20 to 25-degree grade. The operator parked the vehicle and went to obtain help. En route he met one of the mine shiftbosses who was familiar with the operation of Scooptrams. He advised the shiftboss of what he was doing but did not tell him of the specific problem with the vehicle. When the shiftboss got to the Scooptram he noticed it was parked in such a manner as to obstruct ramp traffic so decided to move it. Three times the vehicle's wheels spun out because the faulty drive line had left the unit with power only to the front wheels. Because of the leak in the brake bladder the successive brake applications finally emptied the braking system of the brake

fluid thus allowing the vehicle to roll backward. The operator tried unsuccessfully to run into the ramp wall but the Scooptram continued down until it struck the Unimog.

The driver of the Unimog seeing the Scooptram continuing toward him, put his vehicle in reserve and attempted to back down ahead of the Scooptram. The Unimog struck the wall about 25 feet from 2475 level and then was struck by the Scooptram when about 15 feet from the level. When this happened Mr. King either jumped or fell off the Unimog and was run over by the Scooptram.

At the inquest held in Stewart on September 20, 1974, the jury arrived at the following verdict:

> 'We the jury, having been empanelled, find that Glen King of Calgary, Alberta, aged 18¼ years, died on the 15th day of August 1974 at 4:12 p.m. as a result of shock and surgical emphysema. We find that his death was unnatural and that it was accidental. We find that negligence was the cause. We attach no blame to any person in connection with his death.
>
> 'We recommend that a doctor be flown to Tide Lake when a serious accident is reported.
>
> 'Also, that if any mobile equipment parked or stopped precariously during shift, a tag must be placed on a conspicuous place until operator or mechanical personnel authorized to remove tag.
>
> 'Also, no scoops should be allowed on ramps during manhaul.'

Arthur Wilson Ryan, aged 28 years, and employed as a miner trainee at Myra Falls mine of Western Mines Limited, died on November 1, 1974, subsequent to falling in 12R1106 manway.

This wooden cribbed manway, 69 feet in length and with an average inclination of 50 degrees was driven to service 12R110 cut-and-fill stope but had been plank barricaded at the bottom, posted with a 'Keep Out' sign and bulkheaded at the top, as it had not been in service for an extended period of time. The lower entry ladder had been removed also.

Mr. Ryan and his lead-hand partner were working 12R110 stope and were endeavouring to locate the muck covered bulkhead over the manway in order to extend it above the fill level. As the two men were unsuccessful in their search the day previous, the miner on going to work directed Ryan to go to 12 level, climb 1106 manway, and bang on the bulkhead in order to locate its position in the stope.

Ryan proceeded to 12 level, was directed to the foot of the manway, and was last seen alive at that point.

About a half hour after Ryan left to enter 12R1106 manway, the miner, on not hearing any knocking, went to the manway to investigate why. He found Ryan lying inert over a sprag on the footwall side of the manway and about 15 feet above 12 level. The miner obtained help and removed Ryan to the surface right away. Ryan was placed in an ambulance and, while being taken to Campbell River, was given oxygen therapy and external cardiac compression. The doctor, who was met enroute, examined Ryan and pronounced him dead.

A subsequent examination of the manway located Ryan's glasses on No. 3 landing, indicating that the deceased had climbed the raise at least 21 feet above where his body was found. In addition it was determined that above this landing lit matches would dim and extinguish, thus indicating a low oxygen content in the air. The analysis of an air sample taken in this vicinity indicated an oxygen content of 14.91 per cent.

At the inquest held in Campbell River on March 12, 1975, the following verdict was returned:

> 'We the jury, having been duly empanelled, find that Arthur Wilson Ryan, of Ste. 204 Discovery Village, Campbell River, B. C., aged 28 years, died on November 1, 1974 as a result of a severe blow to head.
>
> 'We find that this death was unnatural and that it was accidental.
>
> 'We attach no blame to any person in connection with the death.
>
> 'We recommend that an underground trainee be impressed that under no circumstance when he has been assigned to the company of another person underground is he to leave the immediate area of that person for any reason whatsoever until such time as the Mine Captain deems him qualified to do so.'

While the physiological cause of death was assumed to have been as a result of severe blow to the deceased's head, it is believed the verdict did not give sufficient consideration to the cause of the injury. This would appear to have been due to the deceased having collapsed in an oxygen-deficient atmosphere and having fallen with sufficient force to suffer a sharp blow to the head.

The District Inspector has advised that since the accident the management has endeavoured to avoid sealing manways with back-fill and that all personnel working underground must wear chin straps attached to their protective hats. He has also recommended that closer supervision should be exercised over persons entering disused areas and then only as regulated in section 23, rule 92. He further suggested some improved method be developed to accurately determine buried manway bulkheads.

Jerald Dewey Davis, aged 29 years, single, and employed as a miner at the Magnum mine of Churchill Copper Corporation Ltd., died from asphyxiation on November 2, 1974, after being buried in muck in 59-3-98 shrinkage stope.

Mr. Davis and his partner had set up staging under the area where they were drilling off bench holes. This was apparently directly above 59-3-100 muck raise. The staging comprised an adjustable steel sprag, one wooden sprag, two ladders, and two 2 by 10-inch planks. After staging up was completed and while the bench holes were being drilled, a framing crew drew approximately 22 cars of muck from 59-3-100 muck raise. On going to lunch Mr. Davis learned of this and also that a hang-up of muck must have occurred, as the muck had not settled beneath the drilling platform. He advised his partner of this and the partner, on leaving the stope, examined the drawpoint and gained permission to blast the hang-up after he had completed his lunch. The two shiftbosses, who authorized the blast, climbed into the stope, checked and considered the staging to be satisfactory and spoke to Davis to insure he was aware of the hang-up.

After eating his lunch Davis' partner heard the muck moving in 59-3-100 raise as he was passing. He immediately climbed back into the stope and saw that the drill staging had collapsed and found Davis partly buried in the hole created by the collapse of the muck. He got down to assist Davis and was advised by a trammer to get out because the muck was moving again in the raise. He did so and a further subsidence took place during which Davis was completely buried.

Crews were assembled immediately and commenced digging down to release Davis. Staging and cribbing was installed as the hole deepened to about 25 feet and approximately 45 tons of muck was removed before Davis was recovered. He had been buried about nine hours and when recovered was pronounced dead by the attending doctor.

No one actually witnessed the accident and, therefore, the exact cause cannot be determined. However, it would appear that the staging on which Davis was standing collapsed at the same time the hang-up released. This would indicate that the wooden back sprag was set in broken ground or in ground that failed when the muck slumped.

An inquest was held in Fort Nelson on December 4, 1974, at which the jury reached the following verdict:

> 'We, the Jury, find Jerald Dewey Davis came to his death on the second day of November, A.D. 1974, at the Consolidated Churchill Copper Corporation Mine, near Fort Nelson, Province of British Columbia, by asphyxiation. We find that his death was unnatural and it was accidental, and we attach no blame to any person in connection with this death.'

The District Inspector of Mines made the following recommendations concerning an accident of this nature:

'1. Under no circumstances are persons to be permitted to work or travel in shrinkage stopes within the anticipated areas of influence of simultaneous muck-pulling operations.

'2. A 'safety' staging, even if supported independently of broken muck, is not to be considered as providing adequate protection for persons working above muck-pulling operations in shrinkage stopes.

'These recommendations are not considered as being original, but are intended to re-inforce well developed safety principles in shrinkage mining.'

Gerd Antpoehler, aged 45 years, married, and employed as a miner by Reeves MacDonald Mines Limited in the Reeves mine, died on November 18, 1974, subsequent to being exposed to a presumed blasting incident followed by a fall.

Mr. Antpoehler was engaged in driving an ore pass raise between 2350 and 2450 levels off No. 1 shaft. This 5 by 5-foot raise had advanced to a point about 50 feet above 2350 level and, on the day previous to the accident, he had drilled 17 holes of a regular 24-hole round. On the day of the accident, he had been delayed in starting to drill the remaining holes because of a power outage at the mine. Because of this outage, which continued for 2½ hours after the start of the shift, Mr. Antpoehler's working area partner decided he would not be able to complete his daily work schedule and went home. Antpoehler decided to stay, inasmuch as he had only a small amount to do to complete his schedule. At noon he phoned the power house to ask if the compressed air was on and this indicates he experienced some difficulty in starting.

After Mr. Antpoehler failed to report off shift at 3 p.m. the shiftboss checked Antpoehler's locker and noted that Antpoehler had not changed into his street clothes. The shiftboss then went into the mine to look for Antpoehler, who was subsequently found lying on the plank staging at the bottom of the raise, on 2350 level. No signs of life could be detected, and Antpoehler was removed to the hospital. The doctor was met en route about 4 miles from the mine. On examination the doctor advised that Antpoehler was dead. A damaged wrist watch on the deceased man's arm had stopped at 2.10 p.m.

An autopsy indicated that the injuries sustained by the deceased were such that death could have resulted either from those he received during the blast or from those he received during his fall. The blast caused rock penetration injuries to the left lung and one of the branches of the left pulmonary artery, while the fall caused extensive fractures of the skull, atlas, and ribs.

The examination of the work heading indicated that the previous round had bootlegged by amounts varying from 12 to 18 inches, the most advanced portion being in the vicinity of the cut holes of the previous round. The examination also indicated the holes had not been properly washed out. In addition a broken 2-foot-long drill steel and a detached bit were found in the vicinity of the staging.

Although there were no witnesses to the incident, it is believed Antpoehler had commenced drilling in a bootleg hole, in which some explosive had remained after the previous blast. It is presumed a blast occurred. The deceased was aware that this drilling practice was illegal; his blasting certificate had been suspended for a two-month period in 1964 for having drilled in a bootleg hole. Although an explosion occurred at that time, he fortunately escaped serious injury.

At the inquest held in Salmo on December 10, 1974, the following verdict was returned by the jury:

> 'We, the Jury, having been duly sworn and empanelled, find that Gerd Antpoehler of Remac, B.C., aged 45 years, died on the 18th day of November, A.D. 1974, as a result of explosion and fall. We find that this death was unnatural and that it was accidental. We attach no blame to any person in connection with the death. We recommend that Company and the Union participate in a more extensive safety programme.'

The inspector, completing the investigation, recommended that supervisors, while on their rounds, scrutinize in greater detail the work habits of their crews.

FATAL ACCIDENTS AND ACCIDENTS INVOLVING LOSS OF TIME

There were 12 fatal accidents and 861 accidents, in which compensation was paid, reported to the Department. These were investigated and reported on by the Inspectors of Mines.

The following three tables classify these accidents as to cause, occupation, and parts of the body injured. The accidents that occurred in the coal mining industry are reported separately from those occurring in all other types of mining operations. The fourth table lists all fatal and compensable accidents which occurred in lode and coal mines over a 10-year period, and relates these accidents to the number of men employed.

ACCIDENTS CAUSING DEATH OR INJURY
CLASSIFIED AS TO CAUSE

	Coal Mines		Mines Other Than Coal	
	Number of Accidents	Percentage of Total	Number of Accidents	Percentage of Total
Atmosphere	7	2.4	9	1.6
Explosives	0	0.0	0	0.0
Falls of ground	14	4.8	40	7.1
Falls of persons	72	24.5	146	25.7
Lifting and handling material	52	17.7	58	10.2
Machinery and tools	76	25.8	143	25.2
Transportation	38	12.9	47	8.3
Miscellaneous	35	11.9	124	21.9
TOTALS	294	100.0	567	100.0

ACCIDENTS CAUSING DEATH OR INJURY
CLASSIFIED AS TO THE OCCUPATION OF THOSE INJURED

Occupation	Coal Mines		Mines Other Than Coal	
	Number of Accidents	Percentage of Total	Number of Accidents	Percentage of Total
Underground–				
Chutemen	0	0.0	3	0.5
Haulagemen	15	5.1	55	9.7
Miners	9	3.1	122	21.5
Helpers	6	2.0	27	4.7
Timbermen and facemen	20	6.8	10	1.7
Mechanics (electricians, supplymen, welders, pipefitters, etc.)	12	4.1	61	10.7
Miscellaneous	38	12.9	11	1.9
Surface–				
Mechanics, electricians, repairmen, etc.	61	20.7	96	16.9
Mill and crusher workers	0	0.0	64	11.2
Carpenters and labourers	2	0.7	57	10.5
Miners and drillers	8	2.7	15	2.6
Vehicle drivers	51	17.4	31	5.5
Miscellaneous	72	24.5	15	2.6
TOTALS	294	100.0	567	100.0

ACCIDENTS CAUSING DEATH OR INJURY CLASSIFIED AS TO THE PARTS OF THE BODY

Location	Coal Mines		Mines Other than Coal	
	Number of Accidents	Percentage of Total	Number of Accidents	Percentage of Total
Eyes	19	6.4	38	6.7
Head, face, and neck	20	6.8	31	5.5
Trunk	77	26.2	155	27.3
Upper extremities	66	22.5	157	27.7
Lower extremities	89	30.3	162	28.6
General	23	7.8	24	4.2
TOTALS	294	100.0	567	100.0

COMPENSABLE* AND FATAL ACCIDENTS RELATED TO PERSONS EMPLOYED IN COAL AND MINES OTHER THAN COAL

Year	Number of Accidents†		Number of Persons Employed		Frequency per 1,000 Persons	
	Coal	Other	Coal	Other	Coal	Other
1965	116	559	649	5,522	179	101
1966	97	739	614	7,210	158	102
1967	92	688	457	6,716	201	102
1968	73	682	553	9,254	132	74
1969	93	725	700	9,633	133	75
1970	172	860	1,275	11,662	135	74
1971	196	737	1,457	10,684	135	69
1972	227	771	1,985	11,231	114	69
1973	294	817	2,216	11,495	133	71
1974	306	1,225	2,522	10,948	121	112

*Subsequent to April 1, 1972, a compensable accident has been determined as being an accident where the injured man is not able to work the next or any subsequent working day because of the injury received. Prior to that date an accident was determined as an injury causing loss of more than three days' work. The statistics since that date are therefore not directly comparable with those of previous years.

†These totals are submitted by the Workers' Compensation Board as having occurred in the mining industry operations, but also include those accidents which have occurred at such operations as ready-mix concrete, black top, cement manufacture, etc., which are not under the jurisdiction of this department.

DANGEROUS AND (OR) UNUSUAL OCCURRENCES

It is believed the sharing of information relative to dangerous and (or) unusual occurrences, whether an actual injury occurred or not, can if heeded, assist in reducing the recurrence of similar incidents where accidents may be involved.

In 1974 a greatly improved response was recorded in the reporting of these incidents as is required by section 9 of the *Mines Regulation Act* and section 10 of the *Coal Mines Regulation Act.* A total of 224 reports were received, of which 19 occurred at coal-mining operations. None were received from placer mines or from sand and gravel producers. Although 103 incident reports were received from underground mining companies, only 66 incidents were reported as actually happening underground.

In further classifying the incidents, 80 were recorded involving the use of mining vehicles of all types except locomotives. Seven incidents involving locomotives were reported. The 80 vehicular incidents may be further divided into 44 reports involving the driving of a single truck and 14 instances of vehicles in a collision. On closer examination it was determined that of the 80 incidents reported, 65 were attributed to driver error and 10 assigned to control or mechanical failure.

Sixty-seven fires were reported and, although two involved considerable building damage, most fires were of a minor nature with 31 reported underground. The main causes of the fires were high voltage arcing, short circuits where batteries were in use, faulty underdashboard wiring of vehicles, ignitions of carbon build-up in Scooptram compressor discharge hoses, frictional heating in machinery, concentrate drying, and during welding and acetylene torch cutting operations.

Incidents involving the use of explosives or during blasting procedures totalled 13, while there were eight reports concerning falls of ground. There were 10 instances of persons being caught by or in machinery. This includes six instances where persons were caught between conveyor belts and pulleys or rollers. There were seven incidents involving the use of cranes and 32 other incidents which could be classified in 17 different categories.

A condensed report of each incident reported follows:

On January 3 at an underground mining operation a workman fell down a ladder at 8.30 a.m. while patrolling the surface tailing line. After losing his balance he fell 24 feet, struck a platform, fell a further 10 feet, and then slid another 25 feet down a hillside. When found at 3 p.m. he was in good condition but very cold, as the temperature was about 25 degrees Fahrenheit. He had suffered a fractured right wrist, fractured pelvis (right side), and fractured right ankle.

On January 6 the driver of an empty 120-ton Lectra Haul truck drove the vehicle off a road and into a 5-foot-deep drainage ditch. The driver claimed the brakes and emergency

steering had failed to function although an examination of the vehicle showed them to be serviceable.

On January 7 a power shovel was damaged by the collapse of overburden from a pit face. Although the exposed face was frozen, it was believed the failure was attributable to moisture having built up a sufficiently high pressure within it to cause failure.

On January 7 the operator of a Marion shovel failed to wait for assistance from a D-9 tractor when descending a ramp. The shovel operator transferred the controls from propel to dig and the shovel ran down ramp about 125 feet before the emergency stop button was pressed and the shovel halted. As the operator had been travelling down in a backward position, he then swung the house around to view his tracks. In so doing the bucket struck and cracked the ram-head cylinder of the tractor coming to the assistance of the shovel. The tractor then backed off as the ram was spewing oil but the shovel operator was unaware of this and again released the shovel, which freewheeled down another 75 feet before being stopped. In reviewing the incident it was recommended that the shovel controls should not be changed from propel to dig while on ramps, and the tractor must be in view of the shovel operator when being used for steering.

On January 9 a Scooptram went out of control and freewheeled down a ramp a distance of 800 feet before running into a cut-out wall. The vehicle was extensively damaged. Investigation revealed that the transmission was without any fluid but that the brakes would have stopped the Scooptram if they had been applied.

On January 14 an underground miner suffered second-degree burns to both hands when he attempted to remove a piece of blasting lead wire protruding from a partly opened 480-volt switch box at a step-down transformer. The switch was being used improperly as a power source for electric blasting by a mining contractor and the miner, while endeavouring to rectify an unsafe condition, inadvertently caused a short circuit.

On January 14, 15, and 16, subsequent to a 55-inch snowfall, a series of avalanches occurred at the mine plant of an underground mining operation. Extensive damage was done to the living quarters, the office building, the fuel storage area, assay office, and mill. In addition the powerhouse, most of the dryhouse, and the mechanical shop and the coal-storage shed were destroyed. No one was injured and only a small maintenance crew was in camp.

On January 14 minor damage resulted when two Haulpak trucks collided when attempting to pass on a narrow, icy road. The investigation indicated the driver of the loaded truck had failed to follow operational procedures in that he did not wait until the empty truck had cleared the narrow road section.

On January 15 a privately operated tandem-axled concentrate haulage truck was demolished after driving off a narrow haulage road to an underground mining operation.

The road conditions were extremely icy and, although chains were on the truck wheels, the driver was unable to negotiate a turn after passing a car.

On January 23 a welder received minor injuries as a result of the detonation of a blasting cap in the muck on the track above the coarse ore bins. The welder was replacing angle iron spacers located between the tracks and, while cutting a retaining bolt with an oxyacetylene torch, an explosion occurred in the muck about 10 inches from the bolt. The welder had cleaned an area of 8 to 10-inch radius around each bolt. It was presumed the unexposed cap was in the underground muck being dumped into the bins.

On January 26 at an open-pit mining operation a tank truck containing 800 gallons of water and methanol rolled back down off a ramp and rolled over. The driver had attempted to change gears while on the ramp and was not successful in doing so. Investigation showed the service brakes to be in good operating condition, as well as the lever-lock brake, but that the cable-park brake had not been connected.

On January 26 a pick-up truck was extensively damaged when struck by an ore truck as it turned off the main haulage road and onto an access road. The accident was attributed to inattention by the ore truck driver as the pick-up truck was in full view. It is possible the pick-up truck would have been more evident if it had been equipped with a flashing light.

On January 30 a fire occurred in the engine of a 100-ton Lectra Haul truck. The truck box was being lowered after dumping a load of rock when an explosion occurred in the engine. The cause of the fire was not determined but a previous similar fire was attributed to a ruptured hydraulic fitting spraying hydraulic fluid over the hot exhaust system.

On January 31 the driver of a Terex loader reported that the brakes failed on his vehicle while he was clearing snow off the edge of a bridge. The vehicle dropped over the edge of the bridge and fell 500 feet into a canyon where it was demolished.

On February 2 at an underground shaft installation the tail ropes of the friction hoist installation were damaged beyond repair when they became entangled. The cause of the incident was not determined.

On February 3 the main ventilation fans stopped at an underground mining operation when a heavy snow load and high winds broke the powerline to the fans.

On February 7 the operator of a Unimog at an underground mine temporarily lost control of the vehicle when he attempted to change gears while descending a ramp. The vehicle which was carrying a load of men was stopped without injury to anyone. The operators of Unimogs have been instructed to come to a full stop on ramps before changing gears.

On February 7 a 30-R drill was badly damaged when it capsized after rolling over a 6-foot drop-off on one of the mine benches. Investigation indicated inattention on the part of the operator.

On February 8 a locomotive and a muck car loaded with mud capsized over a trestle. As the car box was being dumped the chassis slid free of the hold down plate and permitted the car to capsize and to roll the locomotive off the track. Dumping procedures were modified including the separation of mud-loaded cars from the train and the chaining of these cars to the trucks.

On February 15 a fire occurred in the concentrate dryer of a mill building when a positive pressure was built up in the kiln area after the louvres of the induced draft fan system closed up. It was found that the louvres were not operating properly.

On February 15 a compressor discharge hose on a Scooptram, operating underground, caught fire. The fire was immediately extinguished. The cause of the fire was determined to have been an excessive build up of carbon in the hose. Maintenance procedures were modified to prevent a recurrence of the incident.

On February 17 at an underground mine the carbon build-up in a compressor discharge hose of a Scooptram ignited and caused a small fire.

On February 19 a supervisor was struck in the abdomen by a fist-sized rock projected from beneath a tire on the rear wheels of a truck as it was slowly moving away.

On February 23 the battery of an underground locomotive was destroyed by fire at the battery charging station. The fire occurred because the battery was not disconnected from the motor and the control and brakes were set in an 'on' position.

On February 27 the driver of a Haulpak truck sustained minor injuries when his vehicle was tossed around by the loader which was loading the truck. The loader bucket caught a back corner of the dumpbox after the loader had dropped into wheel ruts which developed when its wheels spun in the loose muck.

On February 27 an empty Haulpak truck ran out of control when the trainee driver endeavoured to avoid hitting a pick-up truck halted at the bottom of the ramp.

On February 28 a loaded Haulpak truck, driven by a trainee driver accompanied by an instructor, rolled out of control backward down a pit ramp. The driver instructor changed the gear shift from neutral to reverse and a 'spin out' occurred while, at the same time, the truck struck a berm and the vehicle slewed around.

On March 1 a fire of undetermined origin occurred on a battery locomotive in an underground mining operation.

On March 1 a small explosion occurred in an underground muck pile as a Scooptram was being used to muck out a ramp face.

On March 3 a fire occurred in the concentrator crushing plant of an underground mining operation subsequent to welding operations in a chute. The resulting fire burned about 15 feet of scrap conveyor belting and 20 feet of welding cable.

On March 4 thieves broke into the detonator magazine at a limestone quarry and stole three boxes of detonators. An attempt to break into the explosives magazine was unsuccessful. The camp magazine was of acceptable design with two padlocks in metal-covered recesses, however, the thieves picked the padlocks.

On March 7 one man sustained a broken leg and another received minor injuries when the power pole on which they were working snapped. The men were installing a powerline to an open pit when a haulage truck snagged the sagging line and snapped the pole. Improved traffic control procedures are being established to avoid a repetition.

On March 10 at an underground mine a damaged pantograph on a locomotive pulled off about 70 of the hangers between the 1,500-volt catenary wire and the contact wire.

On March 11 a miner was shaken by the concussion of a bulldoze shot from a nearby blast which had been insufficiently guarded, although his working place had been examined just before he returned. It was determined that closer liaison should be maintained between slushing and tramming crews to avoid a recurrence of this type of accident.

On March 11 at an underground mine a mucking machine operator was squeezed between the drift wall and the mucking machine which had capsized when the bucket struck a rock bolt.

On March 11 an electric flash, accompanied by heavy smoke, occurred as an electrician was opening the door of an electric switch in the concentrator of an underground mine. The investigation could not determine why one of the three 50-ampere fuses blew. It is possible a loose ground wire may have touched a live contact when the door was opened; another possibility is the failure of a fuse at the time the door was being opened.

On March 11 the driver of a loaded 120-ton truck turned the vehicle into the runaway lane after gaining excessive speed while descending a hill. An investigation of the vehicle showed the brakes had been in good working order and had not been used. As the speedometer was not functioning it is possible an excess speed developed and the driver chose to use the runaway lane to safely stop the truck.

On March 12 at an underground operation the control handle of a Mancha locomotive jammed as it approached a decline. As there was no stop block the locomotive ran

uncontrolled about 110 feet down the decline, where it capsized and slid another 30 feet upside down. Instructions were issued to keep the track switch closed at the top of the incline and to remove the control handle locking devices.

On March 14 a loaded Lectra Haul truck ran out of control going down an 8-per-cent grade due to the failure of a copper strip holding the carbon brush in place against the rheostat contacts in the dynamic braking system. The driver stopped the vehicle by running into a large snowpile. He advised he had forgotten to use the emergency dynamic braking system.

On March 14 a small fire occurred in the surface carpenter shop of an underground mine. The fire was attributed to a heat lamp left on a sprinkler valve in order to prevent it from freezing. The heat from the lamp ignited a small piece of plywood.

On March 15 an electrical short circuit behind the instrument panel of a Scooptram caused a small fire in an underground mine. After the investigation recommendations were that vehicle wiring should be checked more frequently for damaged insulation and should be kept free of oil. In addition it was recommended that an improved fire extinguisher bracket be developed for quicker removal of the extinguisher.

On March 16 a spark from arc welding operations ignited acetylene leaking from a nearby hose. The fire was extinguished but it was found that the wrench was missing from the acetylene bottle, the valve of which had not been completely closed.

On March 16 a raise miner was overcome by gas at his working place which had not been properly ventilated subsequent to blasting in three nearby working places about 18 hours earlier. The miner recovered on being removed and the ventilation of his working area was improved.

On March 18 a shovel oiler was struck by a rock which came loose from the wall of an open pit. The rock came loose from a point about 35 feet high on the face, struck the ground near the shovel, and bounced about 30 feet to strike the workman. Work in that area was halted until the face was scaled.

About March 20 a tractor operator, who was constructing a road, received multiple bruises when the tractor he was operating rolled over three times. The tractor was equipped with roll-over protection but the operator was not wearing his seat belt.

On March 21 extensive damage was done to two 200-ton haulage trucks which collided while attempting to pass on a narrow, icy road. The dished effect of the snow at the shoulder of the road caused the rear end of one truck to slew and strike the cab of the other truck. The road was widened immediately after but controlled use of the narrow section would have avoided the accident.

On March 21 a Scooptram operator at an underground mine suffered the amputation of his right index finger between a V-belt and pulley while attempting to connect a jumper hose to the auxiliary air valve in front of the V-belts beyond the grill of the Scooptram. This outlet is used to connect to another Scooptram to provide sufficient air pressure for starting the second vehicle. All Scooptrams having the auxiliary valve in this position were taken out of service until the valves were relocated outside the grill.

On March 22 a crusher operator at an underground mine suffered crushing injuries to his right hand when it was caught between a conveyor belt and a roller as he was attempting to remove a small rock at that point. The conveyor should have been stopped to do this.

On March 24 at an underground mine the compressor hose, oil-pan, battery, and wires of a Scooptram caught fire after overheating. The fire was possibly due to blockage and malfunction of the compressor.

On March 27 the steering wheel and column lifted free in a pick-up truck being driven on a narrow road leading to a mine portal. The truck veered off the road and into a snowbank. It was found that a coupling had failed in the steering column, due to excess wear on splines within the coupling. The driver received minor bruises.

On March 27 two men were dumping waste lubricating oil into the waste-oil burning dump when a flash backfire and explosion occurred in the barrel being dumped. The ends of the barrel distended but did not rupture. Investigation of the incident indicated the occurrence may have resulted from a combination of a hot spot in the burning pit and traces of cleaning fluid solvent in the barrel.

On April 2 an electrical fire occurred in a junction box supplying power to two underground fans. Damage done by a Scooptram to the power cable leading to the junction box caused an electrical overload and fire.

On April 4 an electrical short developed in a conduit buried in concrete. The insulation of the main lead to an M-G set burned. The fire was extinguished by turning off the source of power.

On April 5 a fire occurred underground in the battery box of a battery locomotive. The cause of the fire was not determined but it was believed to have been caused by an internal short in the battery.

On April 5 four men working in a hot muck area of an underground mine suffered respiratory discomfort after being engulfed in dust and SO_2 laden air which suddenly issued from a stope from which muck was being removed. The dust spread throughout the subdrift and down the transfer raise to where a tramming crew was removing the ore drawn from the stope. Although the workmen were wearing protective masks, these did

not offer sufficient protection against the high concentration of gas. The outrush of dust and gas was attributed to the collapse of a hang-up within the stope. Improved respiratory protection has been provided and ventilation control is being upgraded by the installation of a steel ventilation door to replace a wooden one destroyed by concussion.

On April 16 a haulage truck capsized while dumping ore at an open-pit mining operation. It was believed the incident occurred because the fine material of which the berm was composed commenced settling when the truck backed up at an angle to the dump berm. It is also possible that poor illumination was a contributing factor.

On April 17 and 18 two instances of fires were reported in the coal in clean-coal storage area at an open-pit coal mine. It was believed the coal had ignited while passing through the thermal coal drier. Some design changes are being made in the drier to reduce the possibilities of future ignition in that area.

On April 17 a driverless haulage truck at an open-pit mine rolled 240 feet down grade, struck a cable arch, and severed the power cable. The driver was experiencing trouble in releasing the parking brake and got out of the truck to talk to the foreman. When out of the truck, he neglected to insert a wheel chock and the truck commenced to roll away. It was found that the problem in the braking system was due to oil and water in the wet-air tank.

On April 19 the driver of a Lectra Haul truck, parked near a shovel, moved the truck out of the way while the shovel was being moved. He parked about 300 feet from the shovel but was backed into by another truck. The second truck had backed up about 250 feet before striking the parked vehicle, the driver of which sustained a broken left ankle.

On April 20 an avalanche swept down the north side of a valley and 250 feet up the south side to bury a mine road with 8 to 15 feet of snow for a distance of about 250 feet. Following the slide, avalanche control techniques were observed on both slopes of the valley.

On April 23 a mechanic had his right arm so severely torn that it was subsequently amputated after having been caught between a conveyor belt and tail pulley when he was attempting to clean around the moving belt. It was determined the tail pulley guard had been removed and not replaced and that the installation had not been equipped with a trip wire.

On April 23 a fire occurred at an underground mine in the clutch of a pebble mill but was safely extinguished. The fire was caused by the improper functioning of a solenoid air valve which permitted a slow decrease in air pressure, and thereby allowed the clutch to slip and heat. The investigation showed that the solenoid failure was due to impurities in the compressed air. A compressed air filter system was installed.

On April 24 at an open-pit mine a pallet, on which scrap steel was loaded, broke while being moved by a crane. An examination of the pallet after the accident showed flaws that should have been noticed prior to moving the load. As the area below the path of travel had been roped off, no person was endangered.

On April 26 an empty and a loaded truck collided at the crossover point from left-hand to right-hand driving, on the pit haulage road. Each driver stated he was unsure what the other intended to do as each had crossed and then returned to their original road side position. Both vehicles were travelling too fast.

On April 30 the chain for swing boom travel on a Drott carry-deck broke, due to overload when the boom was fully extended and loaded with scrap ball mill liners.

On May 2 a fire occurred in the metallurgical laboratory in the mill of an underground mining operation. The fire originated in a shelf of chemicals, some of which were several years old. These chemicals included samples of frothers, activated carbon, and calcium hypochlorite. It is possible some of the frother and a few grains of hypochlorite were spilled together and ignited spontaneously. The damage was minimal before the fire was extinguished. All remaining tins of old chemicals were disposed of to remove any further hazard.

On May 2, while under the direction of a dump supervisor, a loaded 120-ton Haulpak capsized at an open-pit dump while unloading. The truck was directed to back up at an angle to the dumping berm and the dump settled under the wheels nearest to the edge. Fortunately the operator, who was not wearing a seat belt, slipped to the floor while the steering wheel was pushed into the operator's seat. The investigation indicated some confusion existed between the dumpman's signalling and the driver's response.

On May 6 the driver of a 13-ton Euclid truck hauling ore from an underground mine failed to stop and to lower the dump box before trying to enter the haulage adit. As a result the truck jammed in the adit timbers and the 6-inch air line was torn out. The uninjured driver was discharged.

On May 8 a man was injured when struck a glancing blow by a falling mill liner plate when the crane hook holding the plate broke as the plate was being lowered into a gyratory crusher. The loose plate slipped out into the pocket and struck the workman who was installing wear rails in the pocket. Improved supervision would have avoided having workmen placed immediately below where others were working.

On May 10 at an open-pit mining operation a portion of the waste dump failed under a 120-ton truck before the operator had time to dump the load. The dump which was being built with overburden and oxidized waste had been observed to be actively settling for a few days prior to the incident. The truck drivers had been directed to dump their loads about 25 feet short of the dump edge but, in this instance when the truck was in position

to dump, a crack developed in front of the front wheel and the dump settled slowly. Motion stopped when the rear wheels were about 15 feet below the front wheels. Dumping was suspended in order to permit the dump to dry out. In addition, the professional services of a slope stability consultant have been obtained for the design and construction of the various dumps.

On May 10 a large submarine slide occurred at the waste dump of an open-pit mine, during which time a D-9 caterpillar tractor slid down into the water when the operator was unable to start the engine quickly enough to remove the tractor from the subsiding dump. A D-8 tractor, also working on the dump, was started and removed safely. Both vehicles were about 80 feet from the dump edge when the subsidence commenced. The operators were having their lunch break at 4.15 a.m. and noticed that, although the sea was calm, an irregular wave action existed at the dump face so they decided to remove the tractors with the foregoing results. When the dump stabilized it was noted that the slide had extended for a distance of 300 feet along the face and in toward shore for a maximum distance of 100 feet. The consulting engineers who were making studies of the dump recommended that future dumping should be done, as nearly as possible, to maintain a straight leading face and that no portions should protrude ahead of the face.

On May 12 an open-pit dumpman sustained a fractured left leg when struck by a rock which rolled down from a higher bench after being pushed over the edge by a bulldozer working on the upper bench. The dumpman was directing the dumping of a 100-ton truck at the time and approached too closely to the toe of the upper bench.

On May 14 a ball mill operator at an underground mine injured his left hand and arm when his hand was caught between a conveyor belt and tail pulley. The injured man stated he had gone to examine the tail pulley to determine why the belt was not centring. In doing this he stepped over the pulley into mud and water on which he slipped and fell. Some person unknown had removed the tail guard and, when the operator fell, his hand caught between the belt and pulley.

On May 14 the driver of a grader, that was stopped and was being fuelled, sustained minor injury when his vehicle was run into by another grader. The driver of the second grader claimed unsatisfactory brakes but an examination indicated they were in good working order. It is believed the incident was due to driver inattention.

On May 15 a shiftboss sustained second-degree burns to the neck, wrists, and upper legs when he fell in the subdrift of an underground mine during a run of hot muck out of a drawhole. It is believed the superheated air displaced from the stope during the muck-run swept over the injured man and caused the burns.

On May 16 a fire commenced in some chute timbers at an underground mine when a section of remote control trolley line broke and fell across air and water lines and the chute timbers. The line had been inactive with the power turned off. It is not known by whom or when the line was re-energized.

On May 17 at an underground mine a Scooptram developed a transmission fluid leak and lost forward and reverse power. The machine was stopped and additional fluid was obtained and poured into the engine. On completion the operator started up the engine to check the oil pressure. In so doing he applied first gear and the vehicle rolled backward out of control and down the ramp. The mechanic who had recharged the machine fell off it and struck his head, while the operator steered the vehicle into the drift wall in order to stop it. An investigation showed that the expander tube on the right front wheel had broken and flooded the brake system. Also the emergency brake was inoperative because of a broken tie-rod.

On May 17 and again on May 20 explosions occurred in the automatic oil-fired furnace in the boiler room. No cause could be found for the explosions and the only damage noted was a slight bulging in the east and west casings.

On May 18 a fire occurred underground in the engine of a front-end loader. The operator neglected to take the fire extinguisher with him when he evacuated the vehicle and the fire was so intense that he was unable to return for the extinguisher. The damage to the vehicle was such that it was not possible to determine the actual cause of the fire, but it is believed to have started from an electrical short in the wiring which may have burned a plastic hydraulic fluid line and then ignited the fluid.

On May 18 at an underground mine a 440-volt electrical cable caught fire. The mine was evacuated and the fire extinguished. Approximately 40 feet of cable burned. The fire was believed caused by fly rock damaging the cable and permitting a short circuit to develop.

On May 19 a contractor's Scooptram at an underground mine ran out of control, destroyed a set of ventilation doors, a block wall, and two fan motor starter boxes. The cause of the incident was due to both maintenance and mechanical failure of the braking systems.

On May 21 an electrical fire occurred at a 19-inch double-stage fan in an underground mine. The fire was quickly extinguished without further incident.

On May 21 the raised box of a 100-ton haulage truck at an open-pit operation contacted and broke a 4,160-volt powerline. The truck was being used to spread rock fill on a road and the driver neglected to lower the box as soon as the load was dumped.

On May 22 a fire occurred in a concentrate drier at an underground mine. The cause of the fire was attributed to the failure of a thermocouple switch in the firebox. The switch failed to operate to shut off the fire and, as no feed was moving, the drying concentrate overheated and caught fire. Subsequent to the incident, management has reviewed and upgraded their fire control and fire-combat training procedures.

On May 23 the blasting certificate of a miner was suspended for a week for having inadequately checked a drift face for explosives in bootleg holes.

On May 26 a welder sustained minor injury as a result of the explosion of a blasting cap lodged in the muck in the bottom of a Scooptram where he was using an oxyacetylene torch to cut a bolt. The Scooptram had been cleaned out but the muck in which the cap was lodged was in an inaccessible place.

On May 28 at an open-pit mine a P&H crane tipped over on its side when raising and swinging a load. It was determined that the cab window had jammed against the boom-raising lever and prevented it from being moved from its position. As the load continued to rise, the crane overbalanced causing some damage to the jib pole, to two boom sections, and to the boom foot.

On May 29 a small fire occurred on the floor of a large open-pit shovel when sparks from the cutting of a broken cable set fire to rags and grease on the floor. Better housekeeping would have eliminated this hazard.

On May 31 at an underground mine a small fire occurred on a Scooptram compressor hose. The cause of the fire was a plugged check valve in the air compressor, which caused overheating and ignited flammable material in the hose.

On May 31 a miner in an underground mine was observed to be carrying a lighted safety fuse while transporting other explosives. His blasting certificate was suspended for a 60-day period.

On June 3 at an open-pit operation a workman received facial and eye injuries when the nozzle of the sand blaster he was using was plugged and then exploded.

On June 5 the driver of an open-pit haulage truck failed to lower the box immediately after dumping his load and thereby permitted the box to come into contact with, and break an overhead powerline. The powerline was elevated when replaced.

On June 5 at an open-pit mine the driver of a 100-ton haulage truck, while parking his truck at the end of his shift, backed into another truck and caused extensive damage to the operator's cab. The driver of the second truck fortunately escaped injury.

On June 5 at an open-pit concentrator a motor drive-shaft bearing overheated and ignited the lubricating grease in the vicinity. The fire was extinguished immediately.

On June 6 the driver of a 100-ton truck received shoulder injuries when shaken in the truck cab, when the shovel loading the truck dropped a rock estimated to weigh between 30 to 40 tons into the dump box.

On June 9 the grid box of an open-pit haulage truck overheated and caught fire. The fire was quickly extinguished.

On June 10 a supervisor's pickup truck in an open pit was demolished when run over by a haulage truck. The supervisor and a passenger were in the pickup and parked across the road from the 100-ton truck and on the blind side of it. The driver of the big truck, not being aware the pickup was nearby, went to manoeuver his vehicle to avoid running over some loops of cable on the pit floor. In so doing he ran into the small vehicle, but fortunately the passenger and driver escaped without injury through the passenger window as the door, being already deformed, would not open. It was recommended more precautions be observed when parking in a congested area and that all small vehicles used in the pit area be equipped with a whip antenna or equivalent with a brightly coloured flag on the top.

On June 11 a freight haul truck caught fire and was destroyed as it was being started. It is believed an electrical short ignited raw gasoline released during an engine backfire while an attempt was being made to start it.

On June 12 a fire occurred in the left rear wheel motor of an open-pit haulage truck. The fire was caused by a broken brake fluid line spraying oil on the wheel motor. The fire was quickly extinguished.

On June 12 a diamond driller at an underground mining operation suffered a fractured left wrist and a cut on his left knee when struck by a rotating wrench. The mishap occurred as the driller was kneeling beside his machine with his right hand on the throttle and his left hand holding the jack back wrench in the jack back wheel. Apparently a small piece of 'loose' hit his right hand, causing him to jump and actuate the throttle of the machine. With the machine being in gear and running at full throttle, the rotating wrench in the jack back wheel struck both his wrist and knee.

On June 13 a small fire occurred in the mill building of an underground mine when spilling water and concentrate entered a fuse box and caused a short circuit.

On June 14 a front-end loader was being used to clean up trash at an open-pit mining operation. As a log was being lifted it rolled back over the bucket and struck the cab, causing minor equipment damage.

On June 14 a workman in an underground mine suffered rope burns and a fractured ankle after being struck by a whipping wire rope that broke while under tension.

On June 15 a fire occurred in the reagent storage area of an open-pit mining operation when two drums of sodium ethyl xanthate ignited by spontaneous combustion because of moisture absorbed through hydrolysis. It was recommended the reagent loading platform be covered with a roof.

On June 15 a dump truck loaded with crushed rock overturned on the townsite road at an underground mining operation. The accident was attributed to the vehicle travelling too fast to negotiate a switch back. It is possible the accident may have been caused by vehicular steering and braking inadequacies.

On June 18 a fire broke out in the engine of an open-pit mine haul bus parked adjacent to the company fuel pumps. The bus was destroyed but the fire at the pumps was extinguished. The extent of the damage done to the bus was such that the cause of the fire could not be determined, but it is suspected it was due to an electrical short in the wiring harness of the engine compartment.

On June 20 a truck-trailer unit with a 40-ton load ran out of control for about a half mile down a steep grade before the trailer tipped over as the driver was attempting to straighten it. The unit skidded across and off the road where it struck the side of a rock cut. The driver who received minor injuries advised that, prior to entering the steep grade, he had attempted to gear the vehicle down to retard the speed but that he could not get the vehicle to remain in low gear. As he was attempting to do this the momentum built up so rapidly he found it impossible to do this and the speed was such that the dynamiting of the brakes was ineffective in slowing the vehicle down.

On June 21 a conveyor belt caught fire in the concentrator of an underground mining operation. The fire was caused from hot metal dropping on the belt when welding was done on a screen above the belt. When the workmen returned from a 10-minute coffee break, they found the belt was on fire. A closer and earlier examination of the work area for possible fires would probably have eliminated the danger.

On June 25 a fire occurred in the main clutch of the compressor of a large rock drill at an open-pit operation. The fire was successfully extinguished.

On June 25 a cave-in occurred in the haulage road of an open-pit mine that was being mined by underground methods several years ago. Current drilling practice usually indicates open underground workings which may not always be shown on the old plans of the mine. In this instance it failed to indicate the opening. The caved area was 20 feet wide, 30 feet long, and 20 feet thick to the top of the old stope. The hole was filled and mining continued. Additional drilling precautions are being adopted to endeavour to locate any other voids.

On July 1 a 60-foot length of an open-pit main haulage road collapsed and dropped approximately 15 to 20 feet. The area of failure extended about 40 feet into the road centre. Failure occurred on the weak serpentine-argillite contact below a point where a small amount of water was observed to be seeping from the footwall above the road.

On July 2 a large portion of the south end of an active waste dump slumped and spread out from the toe of the spill face. This operation was being closely monitored and, when it was indicated that the rate of slumping was accelerating, all dumping was stopped and the area around and below the active portion was placed under guard.

On July 3 the driver of a loaded truck of an open-pit mine escaped without injury when the truck was struck by a train at a level road-railroad crossing. The truck driver's view for

oncoming railway traffic was obscured by a stockpile of coal and he was crossing the tracks when he was struck by the train.

On July 3 a small fire occurred in the under-dashboard wiring of an open-pit truck.

On July 6 a small rock slide started from a bench face about 80 feet above the point where a shovel was digging. One rock about 8 feet in diameter landed on the muck pile in front of the shovel after having crossed a 40-foot berm above the muck pile.

On July 12 a loaded 50-ton truck overturned on striking a rock outcrop after climbing the muck at the toe of a berm on a straight section of road. The driver believed he fell asleep momentarily while driving.

On July 18 at an open-pit mining operation a dynamic brake failure was reported involving a loaded 100-ton Lectra Haul truck. The operator was about to travel down an 8-degree grade on the main haulage road and, on applying the dynamic brake, found the vehicle was not slowing down so he activated the emergency brake but found it ineffective also. Air brakes were then applied and the vehicle stopped. On examination of the brake system it was found that, in the electrical propel circuit, two contacts had welded together. This then maintained enough current to one wheel motor to provide sufficient power so as to nullify the effect of the dynamic braking. A further examination revealed that the contactor arm had failed at its pivot point, thus permitting the two contacts to remain together and weld rather than being forced to separate when power was taken off the contact armature as would normally occur when the accelerator was released and the dynamic brake applied.

On July 19 a woman received electric burns to her hands and physical shock when she attempted to pick up an energized wire conductor lying alongside of a road. The conductor was being used for an induced polarization survey. As the result of this incident, the Chief Inspector summoned a meeting with several geophysicists performing such examinations and established a set of operating guidelines to vouchsafe the safety of the public and of the individuals performing the surveys.

On July 21 a small fire occurred on an electric cable in a battery box of a Scooptram in an underground mine.

On July 23 an empty concentrate haulage truck went out of control, struck the rock wall on the right side of the road, swung sharply to the left, and then over the bank. The truck then ran down the bank to the foot of the gulley. The driver was not injured but the tractor unit was damaged beyond repair. A metallurgical examination of the broken piston rod indicated its failure was as a result of the accident, as there were no previous flaws or cracks in the material. The accident was then attributed to driver error.

On July 23 a fire occurred in the gas washer stack of a concentrator drier at an open-pit mining operation. After the fire started the top section of the stack fell onto the concentrator roof. After the fire was extinguished, it was found that the fibre glass stack had in itself burned so it was replaced with steel sections.

On July 24 at an open-pit mining operation a blaster, when testing a blasting machine by detonating a blasting cap, failed to take adequate cover and was struck in the hand with a piece of copper from the cap after it exploded. The blaster sustained two cut fingers.

On July 25 a trammer at the surface dump of an underground mine received multiple bruises and cuts when he fell 40 feet down the dump and then rolled a further 400 feet down the waste pile as he moved to avoid being pinned by the moving unseated body of a muck car he was assisting in re-righting. The trammer had ignored two previous warnings to keep out of the way and also had failed to attach to himself one of the safety belts and lines provided.

On July 26 at an open-pit mining operation a Scooptram operator received second-degree burns to the back of his left hand when he was pouring gasoline into a portable pump. Gasoline splashed onto the hot engine and ignited.

On July 26 a tandem-axled flat-deck carrying a full 3,000-gallon water tank overturned on a switchback as it was descending to a new open-pit haul road. An investigation revealed that a holding chain at the rear of the tank broke, thus permitting the load to shift. In addition as there were no baffle plates in the tank, the shifting water load overturned the truck.

On July 26 a workman at an underground mining operation was using a nail to pry open the lid of a can of paint when gas pressure within the can caused the lid to fly off with some force. When this occurred something struck him in the right eye. The workmen received first-aid treatment at the time and then was driven a considerable distance to a doctor's office where he received treatment that day and the day following. On the third day after, first-aid treatment was again given and on the fourth day the workman was sent from the local doctor's office to a specialist who removed a 12-millimetre nail from the injured man's eye. Apparently this nail was on top of the paint tin lid as it was being opened.

On July 26 at an underground mining operation the use of a hoist was suspended when it was found that three of the six spokes on the brake end of a hoist drum had fractured. It was believed the fracturing was due to differential expansion in the drum caused by excess heat being developed by overbraking.

On July 29 at an underground mining operation a locomotive operator lost control of his locomotive because of a lack of familiarity with the vehicle. The locomotive and the attached loaded muck car passed the dump point and ran down a steep grade to the shaft

station where it struck a small timber truck. The timber truck jumped the stop block and ran through the shaft gate and into the shaft where it damaged the guides. The investigation determined that the operator had turned the brake wheel in the reverse direction and that the locomotive had reached the steep section of track before he had time to reverse the direction of the wheel. As a result the locomotive skidded down the steep grade and struck the timber truck.

On July 30 the operator of a mobile tank drill at an open-pit mine received injuries to his left foot when it was taken through between the front idler wheel and the track. It was determined that the operator manipulated the controls while he was in an improper and unsafe position. While so doing he moved the propel control and was caught. Modifications were made to the drill to render it impossible to be operated until the person doing so is at the correct control position.

On August 2 at an open-pit mine careless operation by the driver of a ½-ton truck resulted in the vehicle running into a ditch striking a large rock, thereby damaging the truck.

On August 3 the driver of a bulldozer at an open-pit mine received head injuries as a result of striking his head on one of the lower roll-cage supports after the tractor backed over a large rock and dropped violently.

On August 4 a short circuit in the electric wiring between the alternator and control panel of a truck caused a small fire in the underground workings at a mine.

On August 7 a truck and trailer unit hauling concentrate from an underground mining operation ran off the road, rolled about 400 feet down a 30-per-cent embankment, and then the tractor caught fire. The driver jumped out before the vehicle left the road. An examination failed to reveal any mechanical defects and it is presumed the accident was attributable to driver error.

On August 7 at an open-pit mine a loaded Haulpak truck being driven downgrade failed to complete a right turn, crossed the road, and ran up on a bank of loose muck where it overturned. The driver claimed the vehicle seemed to have a tendency to pull to the left but a mechanical examination failed to reveal any faulty condition except some stiffness in the steering action.

On August 9 a pickup truck at an open-pit mine was struck by a piece of fly rock originating from a blasting operation 100 feet above the truck, and 700 feet away. The blasters have been directed to establish a zone of prohibited entry of radius not less than 1,500 feet from the site of a blasting operation.

On August 10 a fire, which fortunately caused only minor damage, occurred in the shaft timbers at the collar of an underground shaft. Arcing between two direct current

powerlines ignited timber in their vicinity. It was recommended that when DC powerlines are not in use over a weekend, the power should be shut off and that where possible all electrical cables should be rerouted away from the shaft timbers.

On August 11 a fire occurred underground in the compressor discharge hose of a Scooptram. The fire was extinguished immediately. It was believed the fire started where there was an excess build-up of carbon in the hose.

On August 14 at an open-pit mine the right rear inside tire of a haulage truck exploded with such force as to shatter the windshield, the rear window, and the right door window. The driver had reported the truck brakes to be dragging and heating. The brakes were adjusted but still continued to drag and heat. While the driver was again reporting brake problems the tire exploded because of the heat transmitted to it from the overheated brakes.

On August 14 during a scheduled blast of approximately 100 holes at an open-pit mine, one hole misfired and 30 holes rifled, blowing undetonated Hydromex onto the surface of a bench. On investigation it was determined there was an inadequate supply of Procore III primers for detonating the Hydromex so the blaster in charge had substituted Powerfrac and Forcite cartridges. It was also learned that some of the holes so primed had remained loaded for up to 10 days before the blasting took place.

Canadian Industries Limited does not recommend the use of Powerfrac or Forcite as primer for Hydromex except in an emergency and then conditional upon the use of the equivalent to an 8-inch-diameter bundle of cartridges and an almost immediate blast initiation following loading of holes.

The investigation also revealed that no engineering record existed, relating to the number of holes being blasted, their location, their explosives content, or the manner in which the holes were being loaded.

The cause of the incident was attributed to inadequate supervision and the improper practice of blasting procedures by the blaster who quit the job after this incident.

On August 15 a fire occurred at the powerhouse of an underground mine when an insulation breakdown occurred between phases of a high voltage line feeding a generator. The incident also demonstrated that the alarm warning equipment was inoperative.

On August 17 a loaded 5-ton water truck stalled while ascending the pit access road when the driver was attempting to change gears. The truck commenced rolling backward and did not respond to braking until the maxi-brake was applied, when it skidded into a ditch and capsized because of the sloshing motion of the water in the tank.

On August 17 the driver of a watering truck at an open-pit mining operation sustained extensive steam burns when he removed the radiator cap while the enginer was overheated.

On August 19 at an underground mine a Scooptram ran out of control while descending a ramp. Because of inadequate brakes the vehicle was not stopped until about 50 feet beyond a ventilation door through which it had crashed. The cause of the incident was attributed to driver inexperience and to a lack of proper preventive maintenance procedures. The driver had not checked the machine before using it, because he would have noted an inadequate transmission clutch pressure due to a leak in transmission oil. Lack of proper servicing had permitted water to accumulate in the compressed air receiver. Both of these factors would have influenced the efficiency of the braking action.

On August 19 a workman sustained a fractured right hand and a bruised forearm when his arm was caught between a conveyor belt and roller underground. He had reached in to remove a rock lying on the roller table.

On August 22 a fire destroyed four trailers at an underground mining operation which was being reopened after a long period of closure.

On August 26 a panel truck proceeding downhill on a mining road collided with an up-coming ore truck. The accident was attributed to driver error on the part of the panel operator and to the road surface. Company road regulations require drivers to hold close to the right side of the road, which, in this instance, the driver did not do. In addition the surface of the road was dry loose gravel.

On September 1 a Gallion grader was proceeding up an underground ramp when the front drive wheels spun out and the vehicle lost traction. The operator applied the brakes and depressed the clutch pedal but the vehicle rolled backward about 20 feet and struck a ventilation door frame. This slewed the vehicle around so that it struck the wall and stopped. It could not be determined what caused the accident but may have been attributable to driver error or the possibility of a broken brake line.

On September 1 a workman at an open-pit mine received minor injuries when pinned between the bumper of a truck and a stack of tires. He attempted to pass between the truck and tires as other workmen were adjusting a faulty transmission. Wheel chocks and the parking brakes were not being used.

On September 2 at an open-pit mine the universal joint failed in a grader as it was descending a ramp. The operator applied brakes without effect and the vehicle ran out of control for about 150 feet when it collided with a haulage truck. Both vehicles were extensively damaged but the drivers suffered only minor injuries. The grader operator had radioed that his vehicle was descending out of control but the driver of the truck did not hear the warning. The brakes were inoperative because the hydraulic pumps for

pressurizing the transmission, steering, and brakes are driven by the shaft on which the universal joint failed. The grader is being repaired to provide positive emergency steering and brakes in the event of another similar universal joint failure.

On September 4 the driver of a loaded 100-ton haulage truck backed over the edge of an open-pit waste dump. The tractor operator signalled the driver to stop but he did not do so. The driver jumped out just as the vehicle was going over.

On September 5 because of a faulty dump lever on a pit haulage truck at an open-pit mine the empty box did not descend and caught the power cable to a shovel. The cable was broken into three pieces. The incident occurred during the night shift, hence the elevated box was not immediately apparent.

On September 7 at an underground mine the skiptender inadvertently spilled the equivalent of a skipload of ore into a shaft. Because of a malfunction in the conveyor automatic loading mechanism the skiptender was using a manual over-ride switch to run the conveyor. The switch was used to fill six skiploads but on the seventh he pushed the button before the north skip was properly positioned and the muck dropped down the shaft. While so doing it broke the cutout cable and the hoist stopped. Meanwhile being unaware of the spill, the hoistman moved the south skip 300 feet to the dump pocket. As a result one tail rope developed five loose coils along its length while the other developed four loose coils. These were successfully removed without kinking the ropes.

On September 7 a dangerous incident occurred in the crusher house at an underground mine when a crusher operator, who had placed a bulldoze blast at the crusher feed chute, mistook a blast in the nearby open pit as being the one he had initiated. He returned to the crusher and shut off the blasting whistle. A nearby shiftboss, realizing what was happening, went back to the crusher and called the operator out before the blast detonated. Blasting procedures have been revised to avoid a recurrence.

On September 7 the driver of a loaded Haulpak truck lost control of the vehicle as it was approaching the dump. The driver said he had halted the vehicle preparatory to backing to the dump when the engine stalled. The vehicle continued down the road and ran over the bank.. The driver jumped out without injury and reported that both steering and brakes had failed. The investigation did not reveal any mechanical defects but that the brakes were in the 'dynamited' position.

On September 9 at an open-pit mine the driver of a truck found he had no steering in the vehicle but managed to stop without incident. He had picked the vehicle up from the repair shop where it had been taken for a correction of steering malfunction, however, the vehicle had not been tagged out of service, as requried by Rule 263(d).

On September 11 a Michigan loader operating at an open-pit mine was struck by a 60-pound rock, which rolled off the bench lift above the loader. The rock struck the

bucket guard and then broke the windshield and caused minor injuries to the loader operator. Instructions were issued restricting the operation of equipment below areas where there was inadequate berm protection.

On September 16 a small fire occurred with a steam cleaner at an open-pit mine when the gasoline ignited as the cleaner was being refueled.

On September 16 a miner sustained injuries to his back and right leg after being struck by a fall of ground when he was about to install a rockbolt in an underground stope. It was reported the miner had scaled the area before the accident.

On September 17 at an open-pit mine the operator of a front-end loader-backhoe escaped injury when his vehicle was destroyed after it went over a timber cribbing, dropped approximately 100 feet, and then rolled about the same distance down a slope. The operator jumped out as the vehicle was going over and as he fell his clothing was caught by a protruding snag in the cribbing.

On September 17 a front-end loader up-ended while dumping wet spill material at an open-pit dump. The front wheels settled in the soft ground at the dump edge, thus causing the centre of gravity to move forward with the bucket being elevated. The driver was wearing a seat belt and was able to vacate the vehicle without injury. Instructions were issued directing that such cohesive spill materials be dumped on the berm and then pushed over the edge.

On September 25 a fire occurred in the battery of a locomotive underground while the battery was being charged. The fire was caused by the operator failing to open the main switch on the locomotive and by leaving the locomotive control in the first operating notch. In addition the deadman control switch was not functioning in that it did not cut off the power. The positions of these controls were such that overheating and then a fire occurred in the core of two of the three resistors where locally fabricated Formapex (a laminated cotton fabric board) was being used as insulating material.

On September 25 at an open-pit mine a flagman was directing the turning of a 120-ton truck on the crusher road when he also signalled a mechanic's truck into the area. The large vehicle, while turning, struck the small vehicle and did considerable damage. Although the small vehicle was equipped with an operating strobe light and a whip antenna with a flag attached, the driver of the large vehicle did not see the small truck.

On September 25 at an open-pit operation a dump supervisor had directed a Haulpak truck in the dumping of a load of waste when a second Haulpak came to the dump. He directed the second truck to dump alongside the first truck but the position of the first truck was in the blind area of the second. As a result the second truck backed into the first, causing considerable damage to the cab. The driver of the first vehicle moved across the seat quickly, thus avoiding injury.

On September 28 in the mill mechanics' bay at an underground mining operation a spark fell into the welder's quenching tank and immediately flames shot 20 feet into the air. The fire was extinguished without damage or injury. It is believed someone had either intentionally or inadvertently placed gasoline or some other highly flammable liquid in the quenching tank.

On September 29 the driver of a pickup truck at an underground mine overturned the vehicle while descending a mine road. The investigation indicated that the road was straight and in good condition, but that the vehicle was travelling too fast.

On October 2 the winch, boom, and auxiliary equipment of a Marconaflo tailings reliquefying unit tipped into the emergency tailings pond at an open-pit mining operation. The Marconaflo unit was removing the impounded tailings but undermined its piling foundation.

On October 3 a small fire occurred on an underground service truck. Apparently the disc brake on the drive line had seized and the mechanic attending the problem had instructed the operator to drive the truck to the maintenance shop for further attention. On the way to the shop the disc-brake housing overheated and had to be sprayed with a fire extinguisher.

On October 4 a workman riding as a passenger in the cab of a small locomotive sustained a fractured leg when it was jammed between an underground ventilation door and the locomotive. The door was not seen due to foggy conditions and the injured man should have had his leg inside the cab of the locomotive.

On October 6 five teenage youths made an unauthorized entry in the main adit of an underground operation. The youths had proceeded a considerable distance underground before an outgoing supervisor met them and escorted them out of the mine.

On October 8 the driver of an open-pit haulage truck was overcome as a result of smoke inhalation resulting from a fire in the wiring under the dashboard of the truck.

On October 10 through inattention the driver of a 100-ton haulage truck drove into the rear of another, which was parked in the turnaround area. The driver was given a temporary suspension of duties.

On October 10 a fire occurred on an underground Scooptram as a result of a short circuit developing between a terminal of a loose battery and its holding frame.

On October 10 and twice on the following day fires occurred in the compressor discharge hose of an underground Scooptram. It was determined the source of heat to cause ignition was the malfunctioning of the discharge valves. The mining company proposes to reduce the preventive maintenance check time for the compressors from the manufacturer's recommended 1,000 hours to 250 hours.

On October 12 the driver of a loaded haulage truck at an open-pit mining operation advised that the steering locked as the truck was proceeding down hill. The truck ran into a ditch and rolled onto its left side. The driver had noted in the log book that the steering appeared faulty but did not report the condition to anyone.

On October 16 a crew cab skidded on an open-pit mine road. It left the road and overturned with no injury to the driver but considerable damage was done to the vehicle. An investigation determined that the road was firm but slippery and was not safe for driving at the 30 miles per hour reported by the driver.

On October 18 the operator of a tractor widening an open-pit haulage road was slightly injured when his vehicle capsized while operating on a steeply sloping bank. The roll-over protection structure was bent but undoubtedly offered protection to the operator.

On October 20 the driver of an open-pit haulage truck advised he fell asleep momentarily while driving the truck. During this time the vehicle ran off the road and into a ditch where it came to a halt on its right side.

On October 22 the driver of an empty 100-ton truck leaving the pit area had to take evasive action to escape being rammed by a loaded vehicle of the same size. The driver of the empty truck then followed the loaded truck and got its driver to stop. It was found that this driver was smoking and under the influence of marijuana. The impaired driver was discharged and the information concerning him communicated to the R.C.M.P. He was charged under the *Narcotic Control Act,* found guilty, and fined $250.

On October 22 the driver of a 100-ton truck at an open-pit mine suffered whiplash when another similar truck backed into the vehicle he was driving. The driver of the second vehicle failed to obtain clearance from the dump supervisor before moving his vehicle and ignored the horns of other vehicles warning him to stop.

On October 24 a workman sustained a broken right arm and bruises to the upper part of his body when squeezed between a drift wall and a Scooptram bucket. The Scooptram operator failed to let the workman get clear of the vehicle after stopping to talk to him.

On October 25 a Linkbelt crane touched an energized powerline as the crane was being moved to clear a power pole. It was recommended that, when it is necessary for such vehicles to be manoeuvered in the vicinity of powerlines, the lines be de-energized and the vehicle movements be under the direction of an electrician.

On October 26 a track-mounted diesel-powered utility jumbo parked in a cut-out off a ramp, rolled out and down the ramp, stopping when it ran into another cut-out some 30 feet below. Disciplinary action was taken against the operator who had failed to set the parking brake.

On October 27 some unknown person using a 10-foot fuse and a blasting cap destroyed a toilet in a bunkhouse of an underground mining operation.

On October 28 an empty 120-ton truck crossed from the left to right side of a 68-foot-wide road to run into the dump box of an oncoming truck which it forced off the road. The oncoming truck ran into a ditch and turned over onto its side. The first truck then sustained considerable damage to its cab when it rammed the dump box of the overturned truck. The investigation completed indicated that the driver of the first vehicle, who sustained minor injuries, had been driving his truck too fast for the existing road conditions.

On October 29 the driver of a loaded slurry-mixing explosives truck momentarily stopped looking down the road to view the fuel gauge during which time he drove off the road and into a ditch where the truck rolled onto its left side. The truck which was carrying 25,000 pounds of hot ammonium nitrate solution, 5,000 pounds of ammonium nitrate prills, and 230 gallons of fuel oil spilled 3,000 pounds of the ammonium nitrate solution and 200 pounds of prills.

On October 30 a driller's helper at a rock quarry suffered a fractured left hand when struck by a fragment of new grinding wheel, which disintegrated as he was sharpening a drilling bit.

On November 3 a 35-ton watering truck backed into a shop bay door, thus causing extensive damage to the door. The truck which had been undergoing extensive engine and transmission repairs was undergoing operational checks under power. As the operator had not made pre-starting checks he was unaware that the transmission was in gear and not in neutral, that the throttle was fully engaged because of an improperly installed linkage return spring, and that the engine shutdown device was incorrectly connected and inoperative. The operator was given a two-day work suspension for failing to check the equipment more thoroughly and knowingly starting an engine having a faulty shutdown device.

On November 5 a small fire occurred near the exhaust discharge of T-9 Scooptram which was operating underground. The fire was immediately extinguished by the operator.

On November 6 the blasting certificate of an underground miner was suspended for a two-week period because he was found to be drilling within 3 inches of a hole that had been charged with explosives and blasted.

On November 9 a small fire of possible spontaneous origin was found burning in a plastic bag of Roc Lok resin in an underground mine. The investigation recommended that as the material was flammable it should be stored only in the metal pails in which it is shipped.

On November 12 the failure of a wire rope sling attached to the bottom of a cave permitted a 1-ton locomotive chassis being hoisted to drop at least 600 feet down the shaft. As the mine had ceased operation, the chassis was left in the shaft where it had become jammed in the shaft timbers.

On November 14 a fire which caused extensive damage started between the back of the cab and the dump box of a 100-ton truck loaded with coal. It would appear the fire started in the exhaust system area.

On November 15 a Hyster compactor was slightly damaged after overturning on an embankment while compacting sand on a tailings dam. The inexperienced operator had driven too close to the edge of the berm.

On November 15 a 35-ton haulage truck capsized over the edge of an overburden stockpile when it slumped because a loader operator had been removing material from the toe of the stockpile. The supervisor had checked and indicated the area where dumping was to be done, but the truck driver dumped where the loader-operator indicated instead. The driver was not injured.

On November 16 a fire of unknown origin destroyed the lamproom, official's report room, and a workshop at an underground coal-mining operation. Damage to the buildings and the equipment stored in them was estimated to amount to $600,000.

On November 18 an underground miner was extensively bruised and scratched after being thrown over a mine dump when the car he was dumping flipped over the dump and in so doing caused the whole train, including the locomotive, to do the same. The dumping safety hook to prevent such an occurrence was not used.

On November 18 a Michigan loader ran out of control downhill and overturned on a gravel pile. The runaway was caused by a brake failure attributed to a broken crosslink of a tire chain striking a hydraulic brake filling, bending and cracking a hydraulic line, and thus causing a loss of brake fluid. The driver was not injured.

On November 20 the driver of a 120-ton truck sustained minor injuries when his truck was struck by the swinging shovel bucket during loading.

On November 20 a crew truck being driven up a steep mine road to the underground portal was struck by a large rock which rolled off the hillside. The rock which had been loosened by rain was estimated to weigh about 250 pounds. It struck the truck cab on top of the crew compartment and created a 3-foot-square hole in the canopy. The crew compartment was unoccupied at the time of the incident.

On November 20 the driver of a 3-ton truck equipped with a Hiab crane pulled over to the side of a mine road to permit another vehicle to pass when his vehicle rolled over an

embankment landing in an upright position. The Hiab crane had acted as a roll bar, thus preventing serious damage to the truck or injury to the driver. The accident investigation indicated the snow had been ploughed from the road the day previous and that the ridge at the edge was not over the actual road surface. It is recommended that, after snow ploughing and in particular on curves, the road edge be located and flagged if such a hazard is present.

On November 24 the driver of a loaded 65-ton truck fell asleep while driving, ran off the road, and turned the truck on its side. The driver thought his sleepiness was due to exhaust fumes but an investigation was not able to indicate any evidence of such fumes.

On November 26 an inexperienced truck driver started and attempted to move a 35-ton truck while the bleed valve draining moisture from the air tanks was open. The truck was put into reverse gear and it backed into the shop doors. He then put it into forward gear and ran into the shop wall where it did some structural damage to the building. The investigation recommended that all vehicle maintenance personnel be adequately trained in the operation of the equipment they are required to repair.

On November 26 the driver of a truck descending a narrow quarry road drove too close to the road edge where the soft shoulder pulled the truck over until the road berm collapsed. The truck rolled over coming to rest upside down about 15 feet below the road. The driver sustained minor injuries.

On November 27 a diesel-driven water pump and a propane water heater were destroyed by fire at an open-pit mining operation. The actual cause of the fire is not known but it is presumed a leak must have occurred in the propane gas line and the gas was ignited. The fire spread to some drums of diesel fuel for the pump before it was extinguished.

On November 28 the operator of a 5-cubic-yard shovel was scaling a pit wall adjacent to an access ramp when an unexpected large amount of rock was dislodged. One piece struck one of the sheaves and rolled down the boom striking the cab sufficiently hard to twist it. The impact also knocked out the front windows, bent the controls, and pinned the operator's left leg, which it fractured. The operator advised that the incident occurred so rapidly that he had not had time to swing the bucket.

On November 28 a small fire, which occurred in the underdashboard wiring of an underground transloader, was attributed to a short circuit occurring where the insulation had worn through on two wires.

On December 4 a Drott loader ran out of control as it was descending a ramp at an open-pit mine. The vehicle veered off the road on a soft shoulder, struck an embankment, and rolled on its side in a water-filled ditch. The operator's feet were slightly injured when they were pinned under the roll bar protection. To avoid a recurrence the vehicle's

operating area has been restricted and only the driver is permitted to operate it. In addition modifications were made to the roll bar to permit easier entrance and exit to the machine. The seat belt was not being used.

On December 7 a fire broke out in the motor compartment of an open-pit Haulpak truck. Prior to the fire a broken radiator line, which had sprayed glycol and water over the engine, had been repaired. It is presumed the glycol ignited and set fire to an accumulation of oil and grease on the motor.

On December 7 and 8 both the body and boom of an 82-ton Linkbelt crane were damaged when backed into twice by Lectra Haul trucks. The boom was damaged to the extent that the operator intends to replace it with a new one. Only one of the collisions was reported and that was by the driver of the truck that backed into the body of the crane. He advised he was manoeuvering the truck at night and in fog.

On December 9 a mill mechanic sustained five broken and seven cracked ribs and concussion as a result of a fall. The injured man was directing the operator of an overhead crane in the removal of material from the sump when the load swung and struck the plank on which the mechanic stood, thus causing him to fall. Instructions have been issued directing all persons at such operations to stand well in the clear and that rope guys are to be used to guide the direction of equipment being moved.

On December 11 an electrician of an underground mine sustained flash burns to both hands and neck from an electric arc or flash while checking an electrical failure at an underground substation. The arc destroyed the secondary switch panel. The investigation completed indicated the electrician was using correct testing procedures. It is conjectured the incident occurred as a result of a loose bus bar which arced when a heavy power load was demanded to start a 75-horsepower fan. Alternately the cause could have been attributed to a faulty breaker or to a phase-to-phase or phase-to-ground fault.

On December 14 a Caterpillar rubber-tired dozer at an open-pit mine was extensively damaged by fire. While the cause has not been definitely established, it is believed the operator had not released the parking brake while driving the vehicle. The brake became very hot and ignited fuel oil and hydraulic oil around the brake area. The contents of several fire extinguishers were required to put out the fire.

On December 14 an empty ore train proceeding back underground was in collision with a diesel locomotive, the operator of which had failed to inform the motorman of the ore train of his presence. A block signal system was installed and in use by the ore train, but the motorman of the single locomotive failed to set the signals to indicate his presence on the line. Instructions have been issued to restrict the use of that haulage level while ore is being moved.

On December 20 a mill employee sustained fractures in both bones of his left leg when his foot slipped into the unguarded nip point between a conveyor belt and the return pulley. The workman who was cleaning up a muck spill slid off the muck and into the nip point. An investigation is being made to determine why the pulley guard was not in place.

On December 21 a millwright was endeavouring to remove a buildup of fine concentrate on a conveyor head pulley by striking the moving pulley with a 4-pound hammer. While doing this his loose left coverall sleeve was caught by an idler and his hand was drawn in between the belt and pulley. He stopped the conveyor by tripping the emergency stop with his knee. He received tear wounds to two fingers.

On December 23 two return water barges sank at the tailings pond at an open-pit mine. An investigation is being made to determine the cause but it is believed that the crawl beam on one barge may have hooked onto the other barge and pulled it underwater.

On December 23 a bulldozer operator sustained facial injuries when the rubber-tired bulldozer he was operating ran over a dump berm edge, capsized, and landed upright on the bench below. The operator was pushing material over the dump edge and apparently drove too close.

On December 24 an underground motorman sustained back injuries when he was knocked off the motor when he struck a chute post. The injured man was working contrary to safety directions in that he had another individual in the motor with him and that he was not properly inside the cab.

On December 27 the driver of a service vehicle drove off the access road to an underground mine when he became confused during a white-out condition developed in a snow-covered area during unusual lighting conditions. The vehicle rolled over and came to rest against a dead tree approximately 40 feet below the road. It was recommended that, when visibility limits safe driving, the operator should pull off the road until the visibility is restored.

On December 30 the inadequate insulation on the connecting wires on a two-way radio in a rubber-tired bulldozer caused a short circuit and a fire in the radio. It was recommended that such wiring be better protected.

On December 30 a crane operator at an open-pit mine received second-degree burns to his thighs and knees when sprayed with liquid propane. A 1,000-gallon propane tank was being moved with the crane when the valve at the bottom of the tank was knocked open by a cable. The escaping liquid propane splashed the crane operator.

PROSECUTIONS

Six prosecutions were instituted under the *Mines Regulation Act* and none under the *Coal Mines Regulation Act.*

On May 17 the mine superintendent of Brenda Mines Ltd. was charged with failure to comply with section 21 (1a) of the *Mines Regulation Act* in that he did not insure on May 3, 1974, that certain persons employed at the mine were under the supervision of a properly certified shiftboss. After investigation and advice by the Attorney-General's office, the charge was withdrawn.

On May 23 Adam Milling Ltd., the owner of the Bitter Creek concentrator, was charged with failure to comply with sections 10 (1) and 23, Rule 300 (e) of the *Mines Regulation Act,* in that the company had failed to dispose of all cyanide and dangerous chemicals at the time of shut down of their operation, and that they had failed to notify the District Inspector of the fact that operations had ceased. The manager entered a plea of guilty on behalf of the company on July 12 in Stewart and was levied a total fine of $1,000 for the two violations.

On May 23 Ardo Mines Ltd., the operator of the Roosevelt mining property on Bitter Creek, was charged with failure to comply with section 23, Rules 44 (a) and (b) of the *Mines Regulation Act,* in that the company did not dispose of their explosives at the time their mining operations ceased and for unlawfully storing explosives in a shut down mine. The manager entered a plea of guilty on behalf of the company on July 12 in Stewart and was levied a total fine of $500 for the two violations.

On May 23 Citex Mines Ltd., the operator of the Red Cliff mining property on Bear River near Stewart, was charged with failure to comply with sections 11 and 23, Rules 8 (b) and 44 (a) and (b) of the *Mines Regulation Act,* in that the company failed to comply with the reclamation requirements in section 11; failed to post an 'authorized entry' sign at the workings; failed to dispose of all explosives when work ceased; and for unlawfully storing explosives at a shut-down mine. The manager entered a plea of guilty on behalf of the company on July 12 in Stewart and was levied a total fine of $1,500 for the four violations.

As a result of a fatal accident to Donald William Morgan Punshon on June 30 in a shaft on Placer Lease No. 1394 on Lockie Creek near Tulameen, the owner of the lease was charged with failure to comply with sections 10 and 23, Rule 93 (a) of the *Mines Regulation Act* in that he failed to notify the District Inspector on opening a mine and that he operated gasoline-powered equipment in an underground mine. The owner entered a plea of 'Not Guilty' and at the court hearing in Princeton on February 26, 1975, he was found guilty of both offences and assessed fines of $50 for each charge.

On September 25 an incident occurred at an underground mine where a locomotive operator activated a remote control switch and caused the derailment of an ore train. Subsequent to an investigation of the incident a charge was laid under section 23, Rule 263 (b) of the *Mines Regulation Act* against the operator in that he did not operate the equipment with due care and attention. At the preliminary hearing he entered a plea of 'Not Guilty.' Following this, and because of disciplinary action taken by the company, a grievance was laid by the union on the workman's behalf. The grievance committee upheld the dismissal of the workman as a locomotive operator and assented to his employment in a job of lesser responsibility. Because the findings of the grievance committee indicated the workman was unstable, the charge against him was withdrawn.

BLASTING CERTIFICATE SUSPENSIONS

Five blasting certificate suspensions were issued for violations of blasting procedure provisions, as contained in the *Mines Regulation Act.*

On May 23 an underground miner was found to have made an inadequate check of the sockets of the holes of the previous round, prior to commencing drilling on the next. His blasting certificate was suspended for one week.

On May 31 an underground workman was found carrying a lighted fuse and explosives. His blasting certificate was suspended for a period of 60 days for performing an unsafe act while handling explosives.

On June 22 the blasting certificate of an underground miner was suspended for 14 days for failing to examine the sockets of the holes of the previous round, prior to drilling the next.

On October 23 the blasting certificate of an underground miner was placed in indefinite suspension because the miner failed to adequately guard the scene of an intended blasting operation.

On November 6 the blasting certificate of a miner was suspended for 14 days because the miner had commenced drilling within 3 inches of a hole that had been charged and blasted.

MECHANICAL – ELECTRICAL

Since 1946 in the mining industry and since 1954 in the oil and gas well drilling industry an Electrical Inspector has directed the inspection of electrical equipment installations. Since 1966 a Mechanical Inspector has inspected the mechanical equipment in use at all types of mines and quarries. Since 1973 an Inspector Technician has assisted also in property inspections.

Electrical and mechanical reports as presented by V. E. Dawson, Senior Inspector, Electrical-Mechanical, follow:

MECHANICAL

Underground Diesel Equipment

During 1974, one replacement and 63 new diesel permits were issued to cover the underground operation of diesel-powered equipment. At the end of the year a total of 634 permits had been issued since the introduction of individual permits in 1968.

A summary of the diesel-powered equipment put into use during the year is as follows:

Diesel Equipment	Number of Permits Issued	Total Horsepower
Locomotives	9	182
Load-haul-dump vehicles	21	1,823
Front-end loaders	3	710
Ore carriers	12	1,690
Tractors	2	116
Drilling jumbos	8	471
Service and personnel vehicles	5	205
Diamond drills	1	30
Fork lifts	3	146
Totals	64	5,373

No approvals were issued by the Department of Mines and Petroleum Resources during the year for diesel engines that had not been previously approved for underground use by any other recognized authority.

As the use of fire-resistant hydraulic fluids was to become mandatory after January 1, 1975, a thorough examination was made during 1974 into the types of fluid available and their properties. Unfortunately, an international energy crisis during the first part of the year cast serious doubts on the availability of suitable fire-resistant fluids. There was also a world-wide shortage of certain engineering components, including hydraulic hoses, and this made it extremely difficult for mining companies and equipment manufacturers to plan ahead.

The fire-resistant hydraulic fluids used by industry in general are:

1. Water and mineral oil emulsions
2. Water-glycol mixtures
3. Synthetic fluids such as phosphate esters

Each of these has some advantages and some disadvantages. The water/oil emulsions are the least expensive but are only suitable for moderate operating pressures and

temperatures. They are also unsuitable for applications involving prolonged exposure to low termperatures. They can however be used as a straight replacement for mineral oil in any existing conventional system although, because of poorer lubricating characteristics, the operating life of pumps and other components will probably be reduced.

The water-glycols also can only be used for moderate operating pressures and temperatures but they are able to withstand exposure to low temperatures. They cost more than water/oil emulsions and will attack zinc, magnesium, and cadmium surfaces.

Phosphate esters are the most expensive but can be used at the same hydraulic pressures and temperatures as mineral oils. The lubricating properties of these synthetic fluids are excellent and normal pump lives should be attained. Only epoxy-based paints should be used on surfaces exposed to these fluids as they are not compatible with standard elastomeric hoses and seals. The phosphate esters originally used as fire-resistant fluids contained chlorine and were considered toxic but the products currently available in North America do not contain chlorine and are now classed as non-toxic.

During 1974, a large manufacturer of mobile mining equipment designed a hydrostatically driven loader to use phosphate ester as the hydraulic fluid. As the vehicle was articulated, a 6-foot length of ¾-inch-diameter hose was required to carry the fluid at a pressure of 5,000 pounds per square inch between the two sections of the vehicle. Although extensive efforts were made, a suitable hose could not be obtained anywhere in North America due partly to a world-wide shortage of the type of wire used in the construction of high pressure hoses and partly to the limited demand for hoses to carry synthetic fluids. As a result, the machine had to be redesigned to use another less suitable type of fire-resistant fluid.

Toward the end of 1974, larger quantities of all types of fire-resistant fluids became available and the major distributors were able to guarantee adequate future supplies. One mining company tried water-glycol in a Wagner Scooptram, but unfortuantely they did not investigate sufficiently the essential requirements for such a conversion. For example, water-glycols are not considered suitable for the needle bearings used in the gear-type hydraulic pump installed on this machine. Temperatures of over 150 degrees Fahrenheit were generated in the hydraulic circuit of the Scooptram which is beyond the recommended safe value for water-glycol. Furthermore, these fluids are not considered suitable for gear-type hydraulic pumps unless they are operated at relatively low pressures. As a result of these adverse conditions, the pump and bearings had deteriorated markedly after only 240 hours of service. This experiment showed that a changeover from conventional to fire-resistant hydraulic fluids cannot be made without careful prior investigation and without adequate consultation between users, equipment manufacturers, pump manufacturers, and the suppliers of hydraulic fluids.

A meeting was held in Victoria during November to discuss, in detail, fire-resistant fluids and their application. Representatives of mining companies, oil companies, chemical

manufacturers, and underground diesel equipment manufacturers attended this meeting. It was agreed that more time would be required for equipment manufacturers, oil companies, and users to work together in the development of successful fire-resistant hydraulic circuits with certain types of equipment such as load-haul-dump vehicles. The Chief Inspector of Mines stated that he would be prepared to grant a six-month exemption to the use of fire-resistant fluids at any mine, upon written request, provided that one diesel machine of each type operating at that mine was converted, on a trial basis, to fire-resistant fluids during the six-month exemption period. A full report was to be submitted to him on the results. He furthermore wanted each mine to investigate the use of automatic fire-suppression on mobile equipment in addition to the use of fire-resistant fluids. It was agreed that this meeting that there was no great problem in changing over to fire-resistant fluids on equipment other than load-haul-dump machines and, in fact, some drilling jumbos and hoist control circuits have already been changed over to such fluids.

A Wagner ST-5A(S) Flameproof Scooptram, approved for use in underground coal mines by the Canadian Department of Energy, Mines and Resources was put into service at the hydraulic mine of Kaiser Resources Ltd. during 1974. The approval granted for this machine was only temporary, to permit a limited amount of tunnel driving in rock because the exhaust system was not fitted with a flame trap. The Scooptram had previously been fully approved by the United States Bureau of Mines for use in gassy atmospheres because they considered the water scrubber and its associated low-water and high-temperature safety controls to be adequate protection against the passage of flame out of the exhaust system. This arrangement was not considered acceptable in British Columbia and an approved flame trap had to be fitted to the Scooptram before it could be used permanently. During the period of temporary approval, the operating machine was inspected on site and it was found that all safety devices had either been disconnected or broken and the scrubber was completely empty of water. This experience proved conclusively that safety features can always be circumvented and that a water scrubber alone cannot be considered as sufficient protection against the passage of flame. In future, any diesel engine operating in an underground coal mine in British Columbia must be equipped with approved types of inlet and exhaust flame traps.

Several fires involving underground mobile equipment occurred during the year as a result of a short-circuiting of electrical wiring. Most fires of this type could be avoided if all wiring is properly harnessed and protected against physical damage. Several fires also occurred in air-compressor discharge hoses. It appears that the fires occurred in accumulations of carbonaceous material as a result of faulty discharge valve operation. Excessive deposits may cause discharge valves to stick in the open position resulting in the continuing recompression of discharged air. This in turn results in a rapid increase in temperature to the point where ignition can occur. Fires of this type can be avoided by cleaning and inspecting compressor valves more frequently. As the type of load-haul-dump machine most commonly used in underground mines in British Columbia carries

over 120 gallons of fuel and hydraulic fluid, it is absolutely imperative that maintenance and inspection of these vehicles be maintained at the highest level.

During 1974 the installation of roll-over protection structures acceptable to the Chief Inspector of Mines became mandatory for all mobile equipment operating underground. In the past these structures had only been required for personnel carriers and service vehicles. It was also decided that the provisions of the general rule 266 (b) of the *Mines Regulation Act* and 198 (b) of the *Coal Mines Regulation Act* would apply to all underground vehicles. This will ensure that every vehicle that cannot be steered by manual effort alone in the event of an engine stall or failure will be equipped with an auxiliary steering device that will enable the driver to control the vehicle for sufficient time to bring it to a safe stop.

The following is a summary of all diesel-powered equipment operated underground during 1974:

Equipment	Number of Units Operated	Total Brake Horsepower
Locomotives	29	1,155
Load-haul-dump vehicles	85	9,675
Standard front-end loaders	5	1,260
Ore and waste carriers	24	3,386
Tractors	8	1,061
Drilling jumbos and platforms	34	1,964
Graders	7	567
Service and personnel vehicles	47	2,496
Forklifts	4	202
Diamond drill	1	30
Concrete placing equipment	1	47
Welder	1	49
Mobile crane	1	75
Totals	247	21,967

The minimum total ventilation required for all the listed equipment was 2,780,250 cubic feet per minute, which results in an average ventilation requirement of appoximately 127 cubic feet per minute per brake horsepower.

Hoisting

A Canadian Ingersoll Rand, 200-horsepower, 42-inch-diameter, single-drum hoist, serial number 14878, with a maximum allowable rope pull of 14,000 pounds, was used to sink a 514-foot shaft at the Mosquito property of the Mosquito Creek Gold Mining Company Limited.

A Canadian Ingersoll Rand, 50-horsepower, 36 by 24-inch, double-drum hoist, serial number 1208B, with a maximum allowable rope pull of 5,000 pounds, was installed at the surface inclined skipway of the Noradco property of Nordore Mining Company Limited.

During 1974, mining operations ceased at the Pride of Emory mine of Giant Mascot Mines Limited, resulting in the removal from service of a Stephens Adamson, 75-horsepower, 48-inch-diameter, single-drum hoist.

As a result of the suspension of mining operations at the Britannia mine of Anaconda Canada Limited, the following hoists have been taken out of service:

No. 8 Shaft hoist – Canadian Ingersoll Rand serial number 1550B; 96 by 60 inch, double drum, 450 horsepower; maximum allowable rope pull, 21,000 pounds.

No. 7 Shaft hoist – Canadian Ingersoll Rand serial number 1546B; 72 by 48 inch, double drum, 250 horsepower; maximum allowable rope pull, 16,000 pounds.

No. 10 Shaft hoist – Hardie Tynes serial number RR 55; 84 by 54 inch, single drum, 700 horsepower; maximum allowable rope pull, 26,500 pounds.

No. 10 Shaft friction hoist – Canadian General Electric, 80-inch, 4-rope friction hoist and disc brakes; maximum rope speed 2,200 feet per minute; 1,000-horsepower DC-drive motor.

During 1974, 55 breaking test reports were received for samples of hoisting ropes tested to destruction in accordance with Rule 164 of the *Mines Regulation Act* and 85 nondestructive test reports were received in this same period. Sixty-three of these nondestructive tests were performed by Wire Rope Industries of Canada Limited using a D.C. Defectograph and 22 were performed by Rotesco of Canada, Limited, using their A.C. Electromagnetic Rope Tester.

As a result of the continued use of nondestructive rope testing techniques, 25 separate four-month rope-life extensions were granted by the Chief Inspector of Mines, permitting hoisting ropes to remain in service beyond the normal two-year statutory limit.

Off-highway Trucks and Mobile Equipment

A paper on the brake testing of large mining trucks was prepared at the request of the Society of Automotive Engineers. For the past several years all open-pit mines have been conducting on-site brake tests of their large mining trucks. These tests are performed on fully loaded vehicles from speeds up to 25 miles per hour on downgrades averaging 8 per

cent. This type of testing was originally requested after several accidents had occurred due to loaded trucks getting out of control on downhill runs and the service braking systems proving inadequate to stop the vehicles. Apparently these rigorous on-site brake tests have not been performed elsewhere and the Society of Automotive Engineers is most interested in the results. The Sub-Committee responsible for SAE Performance Standard J166 'Minimum Performance Criteria for Braking Systems for Off-highway Trucks and Wagons' has also shown considerable interest in the brake test program and copies of all results have been submitted to them.

During 1974 a concerted effort was made to conduct as many tests and obtain as much information as possible. With the full assistance and co-operation of the open-pit mines in the Province, several hundred tests were conducted. Many interesting observations were made as a result of this brake test program.

The average stopping distances obtained for different classes of vehicles and for similar vehicles operating at different mines show a considerable degree of variation. This is illustrated by the following table.

AVERAGE 20 MPH STOPPING DISTANCES ON FULLY LOADED TRUCKS ON AN 8-PER-CENT DOWNGRADE

Size of Truck (tons)	Average Stopping Distances from Individual Mine Results (feet)	Mean Values (feet)
35	53	53
50	84 85 55	75
65	62	62
85 and 100	60 200 90 101 152 183 197	140
120	192 173 214	193
200	255 155	205

Although there is little consistency in these results, they do show that any size vehicle can be stopped by the service brakes alone from an initial speed of 20 miles per hour on an 8-per-cent downgrade in less than 200 feet provided that the brakes and the control circuits are correctly adjusted in accordance with the manufacturer's specifications.

The test results also show that in general, smaller vehicles can be stopped in shorter distances than larger ones, which conforms with currently accepted brake performance criteria. The validity of this concept is, however, questionable. As the size of earth-moving equipment is continually being increased, the braking capacity should be increased proportionately. If an acceptable, arbitrary stopping distance can be established for any given set of operating conditions, this distance should be applicable to all classes of vehicles, regardless of their size, operating under the same conditions.

There appeared to be a certain amount of confusion at some mines regarding the correct or maximum permitted hydraulic pressures for the various types of brake in use. For example, hydraulic pressures as low as 400 pounds per square inch are being used on the expander-tube brakes fitted to the front wheels of 85 and 100-ton trucks although the brakes manufacturer will allow pressures up to 650 pounds per square inch on these brakes. Inadequate heat dissipation from rear disc brakes was evident during many of the brake tests, and it is possible that, due to the front brakes not developing their designed brake torque, there was inequitable sharing of the total brake load between the front and the rear brakes. Better consultation between suppliers and users of equipment is obviously needed to resolve this type of problem.

The value of these brake tests is borne out by the fact that on many occasions potentially serious defects in the braking systems were revealed. Although many of the defects were due to inadequate maintenance some were the direct result of incorrect components having been supplied by the manufacturer.

The brake tests conducted up to the present time have shown conclusively that this type of test can be performed safely and without any fear of damaging the vehicle or the braking components provided that the vehicle is well maintained and is in good operating condition at the time of the test. In order to improve the brake test program it is hoped that there will be more direct and continuing consultation with mine personnel and manufacturers of trucks, wheel motors, and brakes. If representatives of these groups could jointly organize and witness a series of full-load, downgrade brake tests, it is certain that the experience would be beneficial to all concerned.

A fatal accident occurred at an open-pit mine during daylight hours when a 120-ton truck ran over a small 1-ton flat deck truck which had been parked in the blind spot near the larger vehicle. Up to this time most small vehicles had used a roof-mounted flashing light to indicate their presence to operators of larger vehicles with restricted vision. As a result of this accident, however, all smaller vehicles operating in proximity to large production units are now required to be equipped with a whip antenna, fitted with a small light and a conspicuous flag or pennant of sufficient height to bring the upper portion into the normal field of vision of the large truck operator. When not in use they can be folded down or telescoped. In addition to the use of whip antennas, it is also required that no vehicles, other than production vehicles, are to enter an operating pit or dump area unless the immediate supervisor has been notified and has given specific permission and directions for such entry into the operating zone.

The following is a summary of the major equipment in use by the mining industry in 1974:

DUMP TRUCKS

Capacity of Vehicle *(tons)*	Number in Use
0 – 20	312
21 – 40	175
41 – 60	52
61 – 80	23
81 – 100	113
120	69
170	5
200	22
Total	771

PIT SHOVELS

Size of Shovel Bucket *(cubic yards)*	Number in Use
0 – 2	13
2¼ – 4	18
4¼ – 6	21
6¼ – 8	8
9 – 11	9
12 – 14	7
15 – 16	17
25	4
64 (dragline)	1
Total	98

FRONT–END LOADERS

Size of Bucket *(cubic yards)*	Number in Use
0 – 2	105
2¼ – 4	139
4¼ – 6	57
6¼ – 8	12
8¼ – 10	9
10¼ – 12	7
12½ – 15	6
20 – 25	5
Total	340

MOBILE CRANES

Capacity (tons)	Number in Use
0 – 10	20
11 – 20	15
21 – 30	7
31 – 40	6
41 – 50	6
61 – 70	3
81 – 90	2
Total	59

ROTARY DRILLS

Size (Inches)	Number in Use
0 – 6	13
6 1/8 – 9	13
9 1/8 – 12	23
12 1/8 – 15	8
Total	57

AUXILIARY EQUIPMENT

Type of Equipment	Number in Use
Tractors and dozers	229
Graders	84
Scrapers	34

Overhead Bridge Cranes

During 1974, routine inspections revealed many cases of unsatisfactory maintenance of overhead cranes, particularly with respect to the wire ropes. One accident, which fortunately did not result in personal injury, was caused by the failure of a rope. The trolley of the crane involved was equipped with two separate hoists: a 40-ton unit and a 10-ton unit. Both of these were being used together to handle a large single load. The rope on the 10-ton hoist, which was being pulled sideways at the time, broke presumably as a result of a weight transfer caused by a shift in the position of the suspended load. This type of crane is designed for vertical lifting only and the ropes must not be subjected to side pulls. Furthermore, where two hoists are mounted on a single trolley, they should not be used simultaneously.

Several cranes were found to have suffered structural damage as a result of hook overtravel due to faulty or incorrectly set overwind limit switches and in most cases,

repairs to the cranes had been made locally. It is most important that any repair work involving structural members of cranes be made only under the direct supervision of the manufacturer or his authorized agent or an independent engineer competent in this type of repair. In general, many operators found it necessary to review and revise their crane inspection and maintenance procedures.

General

During 1974, sixteen regular meetings of the Joint Standing Committee on Mobile Equipment were held in Vancouver. This interdepartmental committee was formed for the purpose of jointly evaluating steering, braking, and other safety systems on mobile equipment used throughout British Columbia and regulating the safe use of such equipment. The committee comprises four members: one representative from the Engineering Branch of the Department of Transport and Communications, one from the Motor Vehicle Branch of the Department of Transport and Communications, one from the Workers' Compensation Board, and one from the Department of Mines and Petroleum Resources.

The work of this committee has been well received by industry in general as it provides a forum for the discussion of technical proposals and developments leading to the co-ordination of regulations pertaining to mobile equipment safety and provides a single group with which industry, technical associations, and other government departments can communicate on these technical matters. As the work load on this informal committee has steadily increased since its inception, a request was made during the year for formal recognition, clearly defined terms of reference, full or part-time technical assistance, and permanent office space. The validity of this request has been recognized and the committee has now been formally designated as the Mobile Equipment Committee.

ELECTRICAL

Electrical power consumption for the calendar year 1974 showed a marginal increase over 1973. This was mainly attributable to expansions at existing mining operations and some increased activity in the area of coal mining.

During the year a report was received concerning a member of the public having touched an electric wire, which was being used as part of an induced polarization survey network. This act resulted in injuries, in the form of shock and burns.

Subsequent to this incident, geophysical surveying guidelines for the use of electricity were issued in the form of a directive by the Chief Inspector of Mines, and these became effective on January 1, 1975.

These guidelines were drawn up following discussions between representatives of geophysical exploration companies operating within the Province, and members of the Department of Mines and Petroleum Resources, and are intended to minimize the electrical hazards that may develop from the use of electrically operated geophysical equipment.

Following the success of the electrical meeting held by the Department of Mines and Petroleum Resources during September 1973, the mining industry electrical supervising personnel responded by organizing a yearly electrical symposium. The first meeting of this kind was hosted by Utah Mines Ltd., Port Hardy, on November 28 and 29, 1974.

The symposium was well attended and representative of the main body of electrical superintendents of the mining operations within the Province. The symposium was organized with four guest speakers covering topics ranging over safety through to aspects of plant design, with ample opportunity for open discussion.

The general conclusion of the participants was that the meeting had developed a better understanding of common problems.

Following on from the enthusiastic interest that has been developed in respect to achieving immediate improvements in safety standards throughout the mining industry and, in particular, that related to mining equipment, work is proceeding to include within the CSA Part V section of the *Canadian Electrical Code,* specific details of safety requirements for mobile electrical equipment.

A safety feature currently receiving attention is that of providing a reliable main disconnect switch, of compact design and suitable for mounting in the lower car bodies of such mobile electrical equipment as draglines, shovels, and drilling rigs.

Subsequent to this discussion with electrical staffs at mining operations and a local British Columbia manufacturer of equipment, a disconnect switch is presently being developed.

During the past year considerable time has been devoted to a review of the existing underground coal mining electrical systems, and is continuing with a view to keeping abreast with modern developments.

ELECTRICAL STATISTICS

Metalliferous Mines

The following table gives the kilovolt-ampere capacity of the mining company-owned plants at metalliferous mines and the approximate power generated in 1974:

Prime mover	Generator Kva. Capacity	Kilowatt Hours Generated
Diesel engines	35,445	62,513,811
Hydro	3,600	39,529,790
Steam	30,000	102,782,400
Totals	69,045	204,826,001

The electric power purchased from public utilities and from the generating division of Cominco Ltd. amounted to 1,966,655,777 kilowatt hours. This amount, added to that produced by privately owned plants, totalled 2,171,481,778 kilowatt hours.

A general analysis of the connected load at operating mines during 1974 was as follows:

Equipment	Horsepower
Hoists and overhead trams	6,867
Scraper hoists	7,640
Electric shovels	23,573
Electric rock drills	6,225
Mine fans	16,176
Mine pumps	7,727
Rectifiers and M.G. sets	10,534
Air compressors	28,509
Sink-float plant	1,744
Crushing plant	32,645
Grinding equipment	216,149
Concentrating equipment	53,359
Magnetic separators	314
Conveyors	22,187
Mill pumps	40,345
Fresh-water pumps	34,813
Reclaim-water pumps	20,050
Workshops	7,472
Miscellaneous	15,801
Total	552,130

On the track haulage systems there were in use 62 battery, 96 trolley, and 15 diesel locomotives.

Structural-material and Industrial-mineral Operations

In 1974 electric power was used at 61 structural-material and industrial-mineral mines and quarries. Power was produced by company-owned plants at 15 of these operations. The kilovolt-ampere capacity of company-owned plants and the amount of power generated and purchased was as follows:

	Kilowatt Hours
Diesel-driven generators, kva. capacity 15,989–	
Generated	36,184,024
Purchased	31,656,587
Total	67,840,611

A general analysis of the connected load is as follows:

Equipment	Horsepower	
Underground –		
Hoists and aerial trams	338	
Scraper hoists	20	
Fans	150	
Pumps	154	
Total		662
Surface –		
Rectifiers and M.G. sets	13	
Air compressors	583	
Electric shovels	1,570	
Electric drills	140	
Washing plant	814	
Drying plant	1,190	
Crushing plant	13,040	
Conveyors	7,689	
Milling	8,285	
Screens	1,972	
Pumps	2,162	
Workshops	659	
Miscellaneous	3,947	
Total		42,064
Total underground and surface		42,726

One battery locomotive was in use for underground haulage.

At the coal-mining properties electric power was used in two open pits, two underground mines, and three coal-processing plants. Coalition Mining Limited continued with their underground feasibility operations at the Sukunka coal project, Chetwynd.

The distribution of the connected load at collieries in 1974 was as follows:

Equipment	Horsepower	
Underground –		
Ventilation	350	
Pumping	200	
Air compressors	200	
Continuous miners	2,300	
Shuttle cars	875	
Loaders	250	
Conveyors	1,225	
Hoists	50	
Miscellaneous	99	
Total		5,549
Surface –		
Air compressors	4,130	
Draglines	7,700	
Electric shovels	20,430	
Electric drills	4,225	
Conveyors	9,816	
Hoists	270	
Haulage	-----	
Coal breakers	1,130	
Coal washing	4,053	
Coal screening	2,230	
Pumping	24,266	
Ventilation	2,630	
Miscellaneous	14,321	
Total		95,201
Total underground and surface		100,750

The following table and graph show the power consumption in kilowatt-hours in mining operations since 1962:

ANNUAL COMSUMPTION OF POWER (IN KILOWATT HOURS)

Year	Metal Mines	Industrial Minerals	Total	Coal	Grand Total
1962	324,638,348	23,262,091	----------	----------	347,900,439
1963	345,296,000	23,321,875	----------	----------	368,677,875
1964	373,279,423	26,460,100	399,739,523	31,160,152	430,899,675
1965	467,654,500	32,010,923	499,665,423	40,915,890	540,581,313
1966	573,345,458	35,081,797	608,427,255	22,503,551	630,930,806
1967	660,924,689	31,719,975	692,644,664	22,730,640	715,375,304
1968	730,193,710	37,978,960	768,172,670	26,690,100	794,862,770
1969	809,729,000	37,675,440	847,404,440	36,658,450	884,062,890
1970	1,010,775,603	47,274,704	1,058,030,307	96,430,894	1,154,461,201
1971	1,037,369,400	49,458,734	1,086,828,134	132,404,380	1,219,232,514
1972	1,824,145,302	67,882,738	1,892,028,040	205,104,600	2,097,132,640
1973	2,264,782,712	61,781,214	2,326,563,926	219,886,220	2,546,450,146
1974	2,171,481,778	67,840,611	2,239,322,384	346,353,466	2,585,675,855

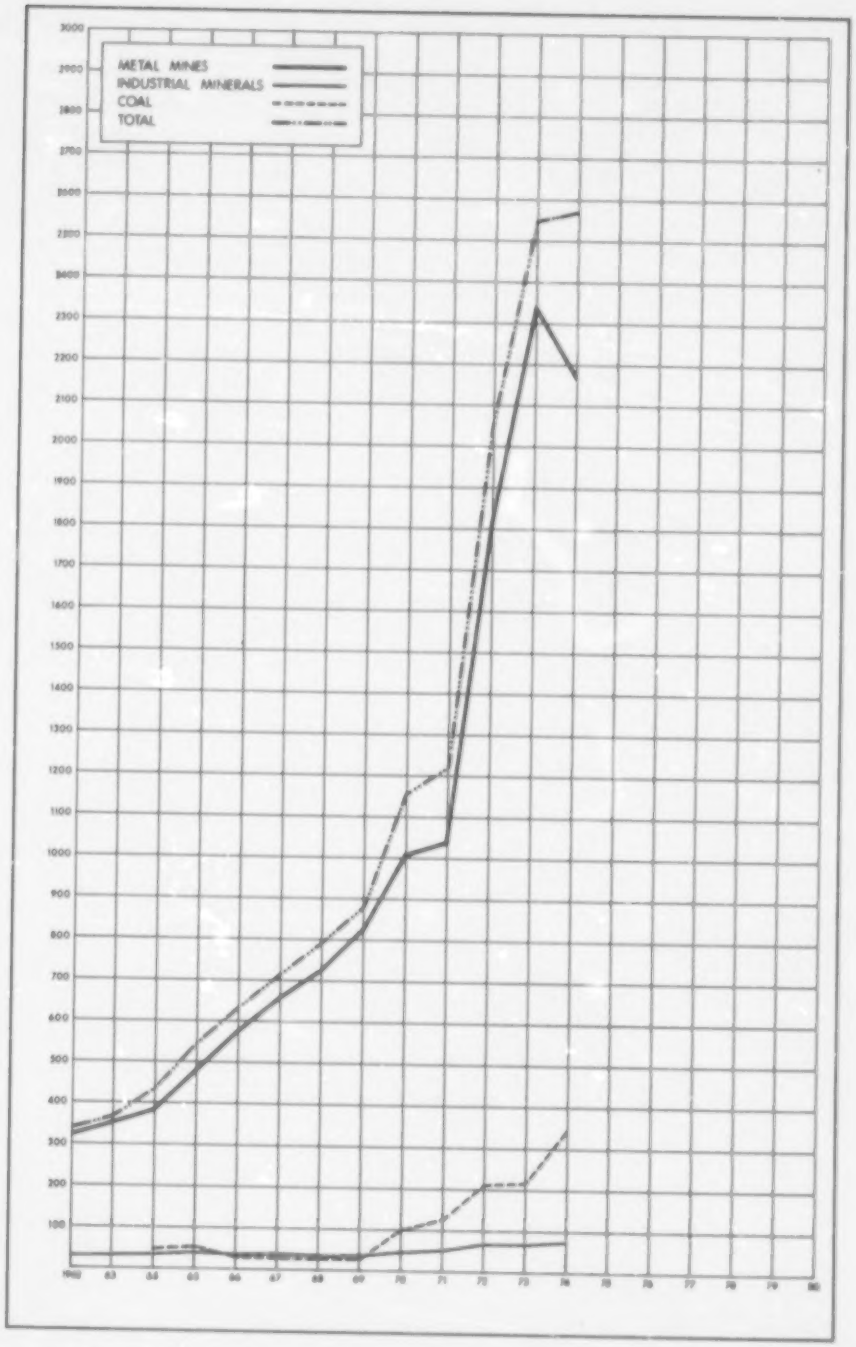

Figure 2. Power consumption in kilowatt-hours in mining operations since 1962.

ENVIRONMENTAL CONTROL

The following is a summary of the environmental control report submitted by S. Elias, Senior Inspector, Environmental Control.

Fifty-six surveys were made of the dust and ventilation conditions in the atmosphere of 55 underground and open-pit metal and coal mines, quarries, crushing plants, and assay grinding rooms in 1974. Measurements of the ventilation and observations of the condition of dust-control systems and other measures relative to the prevention, suppression, and elimination of dust and health hazards were made. Recommendations and advice were given for improvements which it was considered would help to lower the health hazard in general.

Three different instruments were used to sample the various types of dust. The Konimeter has been used in British Columbia since 1935 to sample rock dust at the underground and open-pit mines and plants, at rock and limestone quarries, and at crushing operations. The Midget Impinger and gravimetric sampler were used to sample asbestos dust and fibre in the asbestos industry, and the gravimetric sampler was used to assess the dust hazard in coal mines.

Seventy-nine per cent of the surveys at drilling sites at underground mining operations gave average dust counts less than the Threshold Limit Value (TLV) of 300 particles per cubic centimetre of air. The general improvement in survey results over the past five years is attributed to the improved co-operation of both management and labour in the supply and use of auxiliary ventilation at drill locations.

A deterioration of dust control conditions was recorded at all other underground locations where only 75 per cent of the surveys recorded below the TLV of 300 particles per cubic centimetre of air when compared with the 1973 average of 90 per cent. Closer scrutiny of dust control procedures during the process of ore and waste transfer would assist in regaining the record achieved in 1973.

In crushing plants at underground mining operations 63 per cent of the surveys indicated concentrations below 300 particles of dust per cubic centimetre. This indicated a decline when compared with the 69-per-cent achieved in 1973. Again it is noted that, to maintain dust concentrations below the TLV, careful maintenance of the dust control systems and good housekeeping are required.

When examined in comparison with the crushing plants at open-pit mining operations, the latter has shown an improvement from 41 per cent below 300 particles of dust per cubic centimetre of air in 1973 to 74 per cent of operations below 300 particles in 1974.

A great improvement was registered in dust control in the assay grinding rooms at both underground and open-pit mines as the percentage of surveys showing less than 300

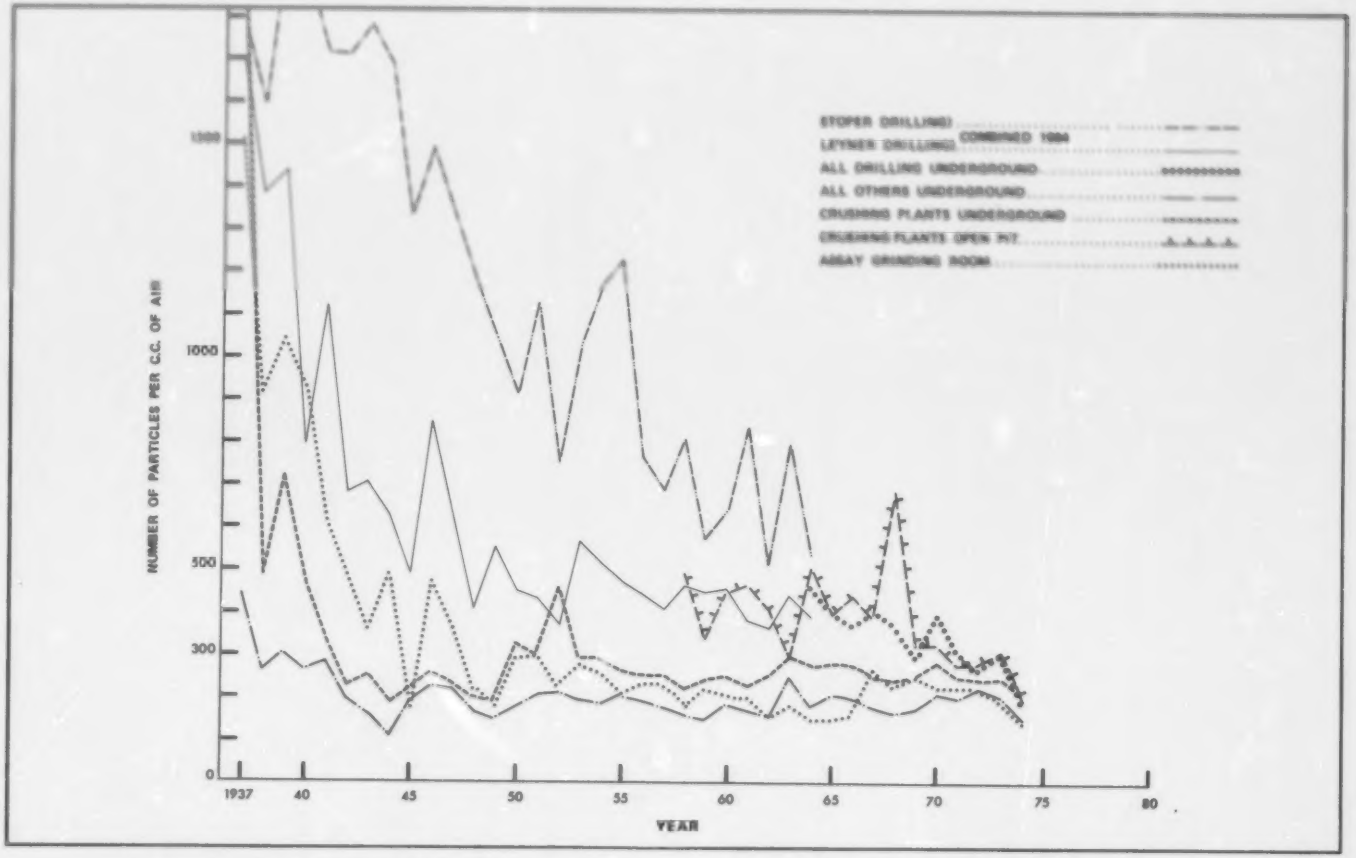

Figure 3. Graph of median average dust concentrations in the metalliferous mining industry.

particles per cubic centimetre increased from 63 in 1973 to 95 per cent in 1974. The improvement is attributed to the operating companies having modified their dust control systems following recommendations made by the Inspector. Dust control at drilling sites in open-pit operations showed some improvement with 73 per cent of the surveys taken showing less than 300 dust particles per cubic centimetre of air but this is still below the 100 per cent achieved in 1972.

At all other operation locations in open-pit mines there has been a deterioration in dust control inasmuch as only 83 per cent of the surveys indicated quantities of dust less than the TLV for silica dust. The deterioration was believed due to the practice at some operations of winterizing dozers by installing canvas cockpit covers and reversing the engine fans to direct engine heat to the operators. Dust created by the bulldozer blade is then drawn across the engine and discharged onto the operator. Where properly constructed cabs with installed heating units have been mounted on the dozers, the dust exposure to the operators has been eliminated.

Figure 3 is a graph of the median average dust concentrations in the metalliferous mining industry and indicates for all types of operations a consistent converging trend to dust concentrations below the threshold limit value of 300 particles per cubic centimetre of air.

An additional 38 surveys were completed at 21 operations producing structural materials and industrial minerals. At these operations, where drilling was being done, 71 per cent of the surveys indicated dust concentrations below the TLV and 42 per cent of the surveys made at the crushing and screening plants were below the TLV. A survey made of one bagging plant indicated dust concentrations above the 300 particles per cubic centimetre of air. Since these surveys were completed, several of the operations have installed new dust collecting systems or have completed recommended modifications to the existing installations.

In addition to the foregoing 37 sound surveys were completed at 15 underground, 11 open-pit, 8 quarry and gravel-pit operations, and at 3 coal mines. A summary of the noise surveys indicated 96.6 per cent of workmen were wearing ear protection where required, 100 per cent of drills in use were muffled, and 79 per cent of operations surveyed were performing audiometric tests on the workmen.

Elsewhere in Canada and in the United States a concerted effort was being made to reduce the overall 8-hour noise threshold limit value from 90 dBA to 85 dBA. This action is supported by this Department because individuals working in areas where the intensity of sound is within that range (85 – 90 dBA) for a full shift, would then have hearing protection made available to them.

Noise surveys were completed on three new drills for drill manufacturers who have been advised that all newly designed pneumatic drills will have to meet the standard of not

more than 110 dB noise level in the Department's test station. It is believed that it is at about this point where the steel noise levels and the mechanical noise levels are about equal. Furthermore if adequately designed earmuffs are properly worn where the external noise is at this level, it will be attenuated to the extent that the level of sound reaching the individual's ears will be within the newly proposed threshold limit values.

Additional noise surveys were completed in audiometric booths and at booth locations where newly installed.

SHIFTBOSS CERTIFICATES

Section 21 of the *Mines Regulation Act* requires that every person employed underground or in open-pit workings must be under the daily supervision of an official who is the holder of a shiftboss certificate issued under the Act. In addition, section 23 of the *Coal Mines Regulation Act* requires that every person employed in open-pit workings at a coal mine shall be under the daily supervision of a shiftboss or other official who is the holder of an open-pit shiftboss certificate issued under the Act.

An applicant for a shiftboss certificate must hold a mine-rescue certificate (surface or underground as requisite), a currently valid first-aid certificate, and is required to pass an examination on the regulations and rules as contained in the respective Acts. Three different certificates are issued; one for underground metal-mining operations; one that is valid in both coal and metal-mining open-pit operations; and a third for sand, gravel, and clay-removal operations. A fee of $5 is charged for the examination. There were 219 applications for examinations filed during 1974.

The Board of Examiners may grant provisional certificates under such conditions as it considers advisable. During 1974, 167 provisional certificates were issued.

Examinations were held at various places throughout, and, of the 195 examinations written, 159 candidates passed. There were 132 shiftboss certificates issued, 54 to underground shiftbosses, 70 to those employed in open-pit mining, and 8 to those employed in gravel pits. The recipients are listed in the accompanying tables.

UNDERGROUND SHIFTBOSS CERTIFICATES, 1974

Cert. No.	Name	Date
748	Melnville Leclair	2/1/74
749	Nelson E. Allan	7/1/74
750	Joseph J. Shlemkevich	21/2/74
751	Neil A. Pacey	26/2/74
752	Clark A. Fortin	26/2/74
753	Reginald M.N. Nordman	26/2/74
754	Marshall Tichauer	26/2/74
755	Allan G. Boon	26/2/74
756	Kenneth A. MacKenzie	26/2/74
757	Marvin W. Crist	4/3/74
758	Thomas D. Meule	21/3/74
759	John J. Cassidy	21/3/74
760	Gregory V. Kirkwood	25/3/74
761	Jack D. Wesson	25/3/74
762	Nicholas Atamanick	24/4/74
763	Kazmir Makosiej	6/5/74
764	Robert A. Horle	8/5/74
765	Clarence K. Martin	8/5/74
766	Vernon C. Reynolds	28/5/74
767	George S. Headley	30/5/74
768	Larry D. Donaldson	30/5/74
769	Zdenek Fischer	5/6/74
770	Jorma J. Kangas	13/6/74
771	Lloyd G. Chabot	14/6/74
772	Wolf D. Kuehne	14/6/74
773	Kenneth M. Williams	14/6/74
774	Carl C. Linn	14/6/74
775	Steve J. Butz	19/6/74
776	David G. Wilkinson	27/6/74
777	Anton C. Magnusson	2/7/74
778	Gary A. Nolin	2/7/74
779	Rudolf F. Bernert	2/7/74
780	Gordon J. Bradley	8/7/74
781	James A. Dales	9/7/74
782	William A. Glover	28/8/74
783	David Smith	30/8/74
784	Pierre Rancourt	5/9/74
785	Ronald G. Devin	5/9/74
786	Peter J. Stoner	5/9/74
787	Pentti A. Pajala	5/9/74
788	Alexander G. Boyle	5/9/74
789	John H. Burns	10/10/74
790	David N. Henderson	10/10/74
791	Gerald R. Paquin	15/10/74
792	James Mellen	31/10/74
793	Keith J. Durston	20/11/74
794	Robert J. Hinkkuri	20/11/74
795	George R. Kubica	21/11/74
796	Brian J. Rice	2/12/74
797	Royce A. Card	6/12/74
798	David W. Price	6/12/74
799	Leonard T.G. Moldenhauer	11/12/74
800	Albert J. Frocklage	18/12/74
801	Dale E. Stevenson	19/12/74

GRAVEL–PIT SHIFTBOSS CERTIFICATES, 1974

Cert. No.	Name	Date
GP-38	Frederick M. Willing	13/2/74
GP-39	Kenneth Robinson	13/2/74
GP-40	Gerald A. Shirss	7/6/74
GP-41	Gordon S. Murcheson	7/6/74
GP-42	Hendrick Van Der Mast	7/6/74
GP-43	Tony H. Meier	4/7/74
GP-44	Lloyd Born	23/9/74
GP-45	Borge D. Sores	21/10/74

OPEN–PIT SHIFTBOSS CERTIFICATES, 1974

Cert. No.	Name	Date
OP-254	Allen L. Bucht	13/2/74
OP-255	Raymond F. Corcoran	13/2/74
OP-256	Gordon R. McDonnell	13/2/74
OP-257	Alvin G. Amundson	13/2/74
OP-258	Robert J. Young	18/2/74
OP-259	Keith W. MacKenzie	20/2/74
OP-260	Malcolm G. Laycock	22/2/74
OP-261	Norman M. Hanson	25/2/74
OP-262	Cesar L. Isodoro	11/3/74
OP-263	John R. Willox	11/3/74
OP-264	Barry A.H. Campbell	15/3/74
OP-265	Henry Schlamp	18/3/74
OP-266	Harvey S. Rielly	18/3/74
OP-267	Ludwig Roessler	19/3/74
OP-268	Douglas F. Wolfe	19/3/74
OP-269	George E. Jackson	25/3/74
OP-270	Peter J. Appleby	1/5/74
OP-271	Morley M. Reed	2/5/74
OP-272	Paul R. Clark	13/5/74
OP-273	Terrence J. Edstrom	5/7/74
OP-274	David A. Morin	23/7/74
OP-275	Bernard W. Cox	25/7/74
OP-276	Garston H. Blackwell	25/7/74
OP-277	Dale V. Dunlop	26/7/74
OP-278	Alexander J. Seize	26/7/74
OP-279	Gerald R. Alexander	26/7/74
OP-280	Gordon G. Sweatt	26/7/74
OP-281	Richard A. Blankman	26/7/74
OP-282	Edward A. Robinson	26/7/74
OP-283	Thomas H. Travis	26/7/74
OP-284	Peter P. Michel	26/7/74
OP-285	Vince P. Rolfes	26/7/74
OP-286	Vicenzo V. Colucci	26/7/74
OP-287	Anthony Cerny	26/7/74
OP-288	Douglas F. Whitford	31/7/74
OP-289	Firmin St. Laurent	31/7/74
OP-290	William Drake	31/7/74
OP-291	James T. Fox	19/8/74
OP-292	Roland W. Riopka	19/8/74
OP-293	Allan D. Meunier	19/8/74
OP-294	Robert J. Wiens	19/8/74
OP-295	Vern D. Noren	20/8/74
OP-296	Leslie M. Stoddart	23/9/74
OP-297	Kenneth Kuehn	23/9/74
OP-298	Myron J. Zajic	23/9/74
OP-299	Benjamin C. Ramage	23/9/74
OP-300	Albert J. Waldner	7/10/74
OP-301	Robert A. Hamaguchi	8/10/74
OP-302	Donald J. Davis	11/10/74
OP-303	Robert A. Koenig	11/10/74
OP-304	John P. Pierce	11/10/74
OP-305	Kenneth E. Durant	11/10/74
OP-306	Michael D. DeLuca	21/10/74
OP-307	Roland Allen	25/10/74
OP-308	Robert L. Bohn	25/10/74
OP-309	Donald J. Holt	1/11/74
OP-310	Larry G. Raymond	6/11/74
OP-311	Daniel O. Thompson	15/11/74
OP-312	Risto R. Rasku	15/11/74
OP-313	David Smith	20/11/74
OP-314	John A. Thomson	27/11/74
OP-315	John Leiding	2/12/74
OP-316	Varge W. Murray	6/12/74
OP-317	Arthur R. McClure	9/12/74
OP-318	John E. Berg	9/12/74
OP-319	William K. Munro	9/12/74
OP-320	Avard W. Nelson	9/12/74
OP-321	Thomas G. Bailey	17/12/74
OP-322	Maurice N. Balez	19/12/74
OP-323	James A. Cahoon	19/12/74

CERTIFICATES OF COMPETENCY

Sections 23 and 24 of the *Coal Mines Regulation Act* require that managers and certain other supervisory officials of underground coal mines shall be the holders of certificates of competency issued under this Act. A Board of Examiners is responsible for setting examinations from time to time for these certificates, for considering applications for interchange certificates, and for advising the Minister in accordance with section 26(3) of the Act. In 1974 four candidates presented themselves for examination, one for a first-class certificate (successfully) and three for a second-class certificate, two of whom were successful. Three other candidates applied for interchange certificates, in this case for first-class certificates, all of whom were granted certificates on the Board's recommendation. The applicants for interchange certificates held equivalent qualifications from Alberta (1) and the United Kingdom (2). All the candidates for interchange certificates were interviewed by the Board.

The following certificates were issued in 1974:

FIRST–CLASS CERTIFICATES OF COMPETENCY

Certificate No.	Name	Date
A239	Michael Fisher	May 1
A240	Walter Riva	June 25
A241	John Shaw	July 22
A242	Kuniomi Yanagihara	November 26

SECOND–CLASS CERTIFICATES OF COMPETENCY

Certificate No.	Name	Date
B340	Spencer Morgan	May 10
B341	Alan Menzies	June 6

CERTIFICATION OF MINERS

In August 1974, Rule 316 of the *Mines Regulation Act* was put into effect making it mandatory for miners to have a miner's certificate before they could be employed at a working place in an underground mine. Rule 316 provides for three types of certificates: a provisional, a conditional, and a permanent. The conditional certificate is issued to miners who were employed in underground mines for at least six months prior to August 1974. The permanent certificate is issued to underground miners who have first-aid, mine-rescue, and blasting certificates, as well as three years' experience, and who have passed a test. Provisional certificates are issued to miners for a limited time or until they acquire a permanent certificate.

By issuing a miner's certificate, the Department of Mines and Petroleum Resources recognizes that a miner has acquired training and skills that will make him a better and safer miner.

Approximately 500 provisional certificates, and approximately 700 conditional certificates were issued in 1974.

MINE RESCUE, SAFETY, AND FIRST AID

Mine-rescue stations fully supplied with mine-rescue equipment are maintained at Fernie, Kamloops, Nanaimo, Nelson, and Prince George. A sixth station was established at Smithers and is being equipped to the same standard as the others. Mine-rescue

co-ordinators are at each station and are fully qualified instructors in first-aid and mine-rescue training. With the exception of Fernie, each station is established as a mobile unit to transport equipment anywhere in that area and to be available for either rescue or training purposes. Each station is equipped with sufficient self-contained, oxygen-supplying breathing equipment to maintain at least two mine-rescue teams of six men each, should an emergency arise in the nearby mines. In addition to this equipment some is on loan by the Department to supplement that owned by various mining companies.

In 1974 the mine-rescue equipment owned by this Department totalled 58 Aerorlox two-hour liquid-oxygen breathing machines, 15 Draeger BG-174 and 60 McCaa two-hour high pressure gaseous-oxygen breathing machines, and 56 Chemox one-hour chemical oxygen-producing machines. The equipment owned by industry totalled 30 Aerorlox, 31 BG-174, 43 McCaa, and 107 Chemox machines. Each station, as well as most mines, has additional auxiliary equipment such as Type N gas masks, self rescuers, gas detectors, oxygen therapy units, and first-aid equipment.

The district co-ordinators of rescue-training make periodic visits to the mines to give rescue-training to open-pit and underground employees and to check the rescue equipment to insure it is being maintained satisfactorily.

A Survival-Mine Rescue Instructor's Manual was compiled by Tom Waterland, Inspector of Mines, with the help of the mine-rescue co-ordinators and mine inspectors.

Courses in both underground and surface mine-rescue training, as well as first aid, are presented by the district co-ordinators. Classes in these subjects were held at various mines and centres throughout the Province. At these classes the instructors trained or assisted in the training of 242 persons obtaining St. John Ambulance first-aid certificates, 203 men in underground mine-rescue work, 305 men in surface mine-rescue, 31 men in gravel pit, and 78 men in mine-rescue survival. Refresher courses were held throughout the Province. The names of the persons completing the rescue courses and awarded Department certificates are contained in the following lists:

UNDERGROUND MINE–RESCUE CERTIFICATES, 1974

Cert. No.	Name	Where Trained
5289	Thomas J. Lobbes	Sparwood
5290	Wayne A. Beckett	Sparwood
5291	Sukhdev Gill	Sparwood
5292	Ronan C. Hicks	Sparwood
5293	Gordon R. Quebec	Sparwood
5294	Kuniomi Yanagihara	Fernie
5295	Rick Eastcott	Fernie
5296	Michael Dennis Fisher	Fernie
5297	Leo F. Piwek	Cranbrook
5298	William J. Johnson	Cranbrook
5299	Clarence J. Simmons	Cranbrook
5300	Gordon E. Tanner	Cranbrook
5301	Adam Ustik	River Jordan

UNDERGROUND MINE–RESCUE CERTIFICATES, 1974 – *(continued)*

Cert. No.	Name	Where Trained
5302	Wolf D. Kuehne	River Jordan
5303	Robert J. Johnson	River Jordan
5304	Shaminder S. Mastana	River Jordan
5305	Manmohan S. Kang	River Jordan
5306	Daniel M. Gannon	Hope
5307	Michael H. Brook	Hope
5308	David D. Alaric	Hope
5309	James L. Lorenz	Hope
5310	Allan Gannon	Hope
5311	Gerald R. Paquin	Campbell River
5312	Leo A. Robidas	Campbell River
5313	Fredrick R. Glasgow	Campbell River
5314	Roger J. St. Louis	Campbell River
5315	Kazmir B. Makosiej	Campbell River
5316	Barry A.H. Campbell	Elkford
5317	John A. Calli	Vancouver
5318	John J. Cassidy	Vancouver
5319	Randy Robert Clarkson	Vancouver
5320	Melvin Plenny Dickson	Brandywine Falls
5321	Robert M. Gardner	Vancouver
5322	Heather Dawn Green (supervision only)	Granisle
5323	William Ralph Jupp	Surrey
5324	George Richard Kubica	Stewart
5325	Thomas Drummond Maule	Vancouver
5326	Terence Frederick Schorn	Brandywine Falls
5327	Neil Arthur Thomsen	Vancouver
5328	Dennis Faraschuk	Campbell River
5329	Thomas G. Le Barron	Campbell River
5330	Zbigniew Skrzynski (supervision only)	Campbell River
5331	Jack A. Jennings	Campbell River
5332	Harold L. Smith	Campbell River
5333	Claud Raymond Blagdon	Stewart
5334	Rudolph F. Bernert	Stewart
5335	Gregory Vincent Kirkwood	Stewart
5336	Gary A. Nolin	Stewart
5337	Edward Patrick Remarchuk	Stewart
5338	Barry Wayne Sheppard	Stewart
5339	Peter J. Stoner	Stewart
5340	Jack Wasson	Stewart
5341	Paul J. Thomas	Vancouver
5342	D. Grant Sjostrom	Vancouver
5343	Erwin P. Spletzer	Vancouver
5344	Gavin M. Anderson	Vancouver
5345	Edward M. Thorton	Vancouver
5346	Glengarry W. Dawson	Vancouver
5347	Lamfaden Mun-choi Chow	Vancouver
5348	Charles Chew Wah Chan	Vancouver
5349	Lance Chetwood	Vancouver
5350	Brian C. Stillwell	Vancouver
5351	Mervyn R. Crawford	Hendrix Lake
5352	Calixte J. Benson	Hendrix Lake
5353	Kenneth L. McClain	Hendrix Lake
5354	John Joseph Gernon	Hendrix Lake
5355	Robert J. Hinkkuri	Hendrix Lake
5356	Nicholas V. Andrade	Fort Nelson
5357	Hannu Kolehmainen	Fort Nelson
5358	Anthony Ivan Johnson	Fort Nelson
5359	William Henry Thompson	Fort Nelson
5360	Roydon James Diederich	Fort Nelson

UNDERGROUND MINE–RESCUE CERTIFICATES, 1974 – *(continued)*

Cert. No.	Name	Where Trained
5361	Serge Ciesla	Fort Nelson
5362	William Welsh	Fort Nelson
5363	Roger Belan	Fort Nelson
5364	Peter White	Fort Nelson
5365	Donald John Frazier	Fort Nelson
5366	William Frank Mader	Merritt
5367	Henri Rollmann	Merritt
5368	Richard Michael Nicholls	Merritt
5369	Peter Steven Wilson	Merritt
5370	James William McBurnie	Merritt
5371	Gordon Howard McDonald	Merritt
5372	Ernest Gordon Grams	Merritt
5373	Gordon Henry Jenner	Merritt
5374	Donald McKay Winter	Merritt
5375	Richard Peter Plue	Merritt
5376	Brian Walter Brenner	Merritt
5377	Howard Joseph Jewell	Merritt
5378	James Thomas Bondesen	Remac
5379	Brian Benjamin Charles Brown	Remac
5380	Roger Donald Cyr	Remac
5381	Thor Norman Fransen	Remac
5382	Paul Potapoff	Remac
5383	Donald Reid	Remac
5384	Barney Ross	Remac
5385	Locke Bailey Goldsmith	New Denver
5386	Richard A. MacKenzie	New Denver
5387	James Nellen	New Denver
5388	Steve Pedersen	New Denver
5389	Reginald L. Stevenson	Kimberley
5390	Duane W. McConnel	Kimberley
5391	Melvin A. Olsen	Kimberley
5392	Larry E. Bussey	Kimberley
5393	Keith J. Durston	Kimberley
5394	Carl J. Johansen	Kimberley
5395	Erie N. Golbeck	Kimberley
5396	Dale R. Sancha	Kimberley
5397	Daniel J. Innes	Kimberley
5398	Earl R. Blundell	Kimberley
5399	James C. Soden	Kimberley
5400	Willi Kronsteiner	Kimberley
5401	Murray C. Slavinski	Kimberley
5402	J. Stuart Tiffin	Kimberley
5403	Frank A. Oswald	Kimberley
5404	Einer Cornelluson	Kimberley
5405	Gary W. Taylor	Kimberley
5406	Ronald S. Hamagami	Kimberley
5407	Terrance J. Villeneuve	Kimberley
5408	Anton Magnusson	Kimberley
5409	George S. Headley	Kimberley
5410	Wayne Gilbert	Kimberley
5411	James S. Drake	Kimberley
5412	Philip D. Graham	Tasu
5413	Daniel F. Hysert	Tasu
5414	Antoni W. Linkowski	Tasu
5415	James W. Munroe	Tasu
5416	Jack Mutka	Tasu
5417	Vernon C. Reynolds	Tasu
5418	Raymond Heistad	Salmo
5419	William Stewart Young	Salmo

UNDERGROUND MINE–RESCUE CERTIFICATES, 1974 – *(continued)*

Cert. No.	Name	Where Trained
5420	Michael John Starbuck Woolley	Salmo
5421	Ignacy Pierzchalski	Salmo
5422	William T. Pell	Salmo
5423	Charles Oed	Salmo
5424	Hugh McLellan	Salmo
5425	John R.M. Little	Salmo
5426	Lloyd Johnson	Salmo
5427	Joseph Horvath	Salmo
5428	Robert B. Gray	Salmo
5429	Brian Roy Collins	Salmo
5430	William A. Bell	Salmo
5431	Lorne Neil Bonderoff	Salmo
5432	Martin Joseph Bernier	Stewart
5433	Royce Osborne Card	Stewart
5434	John Rihan Emo	Stewart
5435	Roderick Hoff	Stewart
5436	Clifford Angus MacDougall	Stewart
5437	Robert Leslie Stewart	Stewart
5438	Walter Harris Waterman	Stewart
5439	Dennis N. Buchberger	Britannia Beach
5440	Raoul Berube	Britannia Beach
5441	James E. Miller	Britannia Beach
5442	Rennie H. MacPhee	Britannia Beach
5443	Anthony D. Crane	Britannia Beach
5444	Smith A. Thomson	Britannia Beach
5445	Borge Bagi Pedersen	Britannia Beach
5446	Fernand J. Losier	Britannia Beach
5447	Andrew R. Lane	Britannia Beach
5448	David George A. Filipchuk	Britannia Beach
5449	Brian Ferrar Nott	Britannia Beach
5450	Joseph J. Berwing	Britannia Beach
5451	Edgar H. Williams	Britannia Beach
5452	Al C. Grudzinskas	Britannia Beach
5453	John M. Demeter	Britannia Beach
5454	Maurice F. DeJersey	Britannia Beach
5455	John W. Mittlestead	Britannia Beach
5456	Gokal Chand Jagga	Britannia Beach
5457	Alan B. Hogarth	Brandywine Falls
5458	Alfred Attrill	Beaverdell
5459	Pete George Urban	Beaverdell
5460	Richard Arthur Gill	Beaverdell
5461	Frank John Szabo	Beaverdell
5462	John Thomas Eaton	Beaverdell
5463	Daniel Paulin Gosselin	Beaverdell
5464	Leon Russel Clapperton	Beaverdell
5465	Gordon Edwin Campbell	Beaverdell
5466	Joseph Paul Simmons	Beaverdell
5467	John Ferruccio Manzocco	Beaverdell
5468	Albert Martin	Beaverdell
5469	Harold Harvey Hewitt	Beaverdell
5470	Alexander James Street	Keremeos
5471	Daniel Sehn	Keremeos
5472	Willis K. Beach	Keremeos
5473	Delmar L. Peterson	Keremeos
5474	Steve J.L. Miller	Keremeos
5475	Lyle M. Little	Keremeos
5476	Philip Hanson	Keremeos
5477	Thomas J. Fletcher	Keremeos
5478	Terence W. Kellerman	Keremeos

UNDERGROUND MINE–RESCUE CERTIFICATES, 1974 – *(continued)*

Cert. No.	Name	Where Trained
5479	David R.L. Salter	Keremeos
5480	Vincent E. Petho	Keremeos
5481	Kenneth G. Konnila	Campbell River
5482	Richard E. Kobelka	Campbell River
5483	Gabriel Hodosi	Campbell River
5484	Leonard T.G. Moldenhauer	Campbell River
5485	Kenneth J. Lampitt	Campbell River
5486	P.E. Michael Becherer	Campbell River
5487	David A. Demeria	Merritt
5488	Alfonso Dimarco	Merritt
5489	Stanley J. Goldstone	Merritt
5490	James Nicholas Horlick	Merritt
5491	Robert F. Kinnaird	Merritt
5492	Allan B. Rowe	Merritt
5493	Glen M. Stephens (supervision only)	Merritt
5494	Miron G. Alexander	Merritt
5495	Mike H. Liss	Merritt
5496	David Clement Press	Merritt
5497	David J. Schebb	Merritt
5498	Wendelin W. Bernhard	Campbell River
5499	Walter H. Flyer	Campbell River
5500	Anthony Clark Austin	Elkford
5501	James Clelland	Fernie
5502	Jeffrey William Fairburn	Sparwood
5503	Ronald M. Hruby	Sparwood
5504	John Dudley Ward	Sparwood
5505	Alfred Colley	Sparwood
5506	Roy Peter Small	Sparwood
5507	Christopher S. Atkinson	Sparwood
5508	Anthony Storey	Sparwood

SURFACE MINE–RESCUE CERTIFICATES, 1974

Cert. No.	Name	Where Trained
O- 889	William Edward Davis	Port Coquitlam
O- 890	Frank R. Moody	Port Coquitlam
O- 891	Kenneth Victor Chadwick	Port Coquitlam
O- 892	Leonard A. Landgraff	Port Coquitlam
O- 893	Leo E. Foy	Port Coquitlam
O- 894	Robert James Young	Port Coquitlam
O- 895	Gary G. Scott	Sparwood
O- 896	Allen J. Rybka	Fernie
O- 897	William J. Johnson	Wardner
O- 898	Clarence J. Simmons	Wardner
O- 899	Dean B. Smith	Fernie
O- 900	Dale V. Dunlop	Fernie
O- 901	Wilbert A. Fair	Fernie
O- 902	Gordon G. Sweatt	Sparwood
O- 903	Gerald R. Alexander	Fernie
O- 904	Peter P. Michel	Sparwood
O- 905	Edward A. Robinson	Sparwood
O- 906	Vince P. Rolfes	Sparwood
O- 907	Allen Bilawchuk	Quesnel
O- 908	David J.R. Henderson	Prince George
O- 909	James F. Hutter	Telkwa
O- 910	Richard T. Morgan	Smithers

SURFACE MINE–RESCUE CERTIFICATES, 1974 – *(continued)*

Cert. No.	Name	Where Trained
O- 911	John R. Taylor	Quesnel
O- 912	Morley M. Reed	Granisle
O- 913	Clifford A. Parkinson	Granisle
O- 914	David Redl	Granisle
O- 915	Michael D. Collison	Granisle
O- 916	Donald K. Habermehl	Granisle
O- 917	Keith O. Dunfield	Granisle
O- 918	Arnold Laramie	Granisle
O- 919	Gordon W. Brown	Granisle
O- 920	Hudson D. Parkinson	Granisle
O- 921	Glen MacLellan	Granisle
O- 922	Dave King	Granisle
O- 923	Terry Franks	Granisle
O- 924	Lawrence M. Gardner	Granisle
O- 925	Valdemar S. Isidoro	Cassiar
O- 926	Raymond A. Elhorn	Cassiar
O- 927	William R. McBride	Cassiar
O- 928	John R. Forsyth	Cassiar
O- 929	John W. Hider	Cassiar
O- 930	Peter Baumgartner	Cassiar
O- 931	Leslie M. Stodart	Cassiar
O- 932	Paul R. Clark	Cassiar
O- 933	Wolfgang F. Schrempf	Cassiar
O- 934	William L. Chesney	Cassiar
O- 935	Robert Lyle Bohn	Elkford
O- 936	Albert J. Waldner	Elkford
O- 937	Roland Allen	Elkford
O- 938	Barry A.H. Campbell	Elkford
O- 939	David A. Morin	Elkford
O- 940	James A. Hearn	Fernie
O- 941	Allan D. Meunier	Sparwood
O- 942	Keith C. Kenneth Kuehn	Sparwood
O- 943	Donald Robert Wilson	Sparwood
O- 944	William W. Iwaskiw	Sparwood
O- 945	Stan J. Pionka	Jaffray
O- 946	George William Wilson	Fernie
O- 947	Mervin R. Miller	Sparwood
O- 948	John J. Ainsworth	Sparwood
O- 949	Terry C. Sharp	Fernie
O- 950	John H. Creed	Sparwood
O- 951	Neil E. Berrington	Invermere
O- 952	Werner Stillemunkes	Invermere
O- 953	David A. Werd	Invermere
O- 954	Ralph Paxton Wismer	Invermere
O- 955	Alan David Stuart	Brisco
O- 956	Lester R. Goodwin	Invermere
O- 957	Thomas M. Cope	Invermere
O- 958	James Ernest Obbard	Atikokan, Ontario
O- 959	George G. McPhail	Toronto, Ontario
O- 960	John H. Ashburn	St. Albert, Alberta
O- 961	Frank L. Walters	Grande Cache, Alberta
O- 962	Edward Wright	Grande Cache, Alberta
O- 963	Roger G. March	St. John's, Newfoundland
O- 964	William H. Childress	Vancouver
O- 965	Joseph K. Labuda (supervision only)	Wabamun, Alberta
O- 966	Sidney Jack Williams (supervision only)	Hinton, Alberta
O- 967	William J. Weston (supervision only)	Robb, Alberta
O- 968	Gordon J. Welch (supervision only)	Sebe Beach, Alberta
O- 969	Bruce L. Erickson	Tasu

SURFACE MINE–RESCUE CERTIFICATES, 1974 – *(continued)*

Cert. No.	Name	Where Trained
O- 970	John Maximenko	Tasu
O- 971	Wayne D. Rains	Tasu
O- 972	Stephen B. Sibley	Tasu
O- 973	Philip G. Tuomi	Tasu
O- 974	Leo Vienneau	Tasu
O- 975	Mark A. Pipke	Port Hardy
O- 976	Kenneth D. Leinweber	Port Hardy
O- 977	William H. Barnes	Port Hardy
O- 978	Harold Le-Roy Hansen	Port Hardy
O- 979	Michel De Repentigny	Port Hardy
O- 980	William A. Dyson	Port Hardy
O- 981	Donald M. MacInnes	Port Hardy
O- 982	Lorne Jonathan Fellows	Grand Forks
O- 983	William Peter Wirischagin	Grand Forks
O- 984	Mike Takacs	Grand Forks
O- 985	Carl John Meyer	Grand Forks
O- 986	James Stanley Rusch	Grand Forks
O- 987	John Max Zaraska	Grand Forks
O- 988	David Hendry Paulett	Grand Forks
O- 989	William Robert Colin	Grand Forks
O- 990	David Ross McArthur	Grand Forks
O- 991	John S. Morris	Grand Forks
O- 992	John Robert Lucke	Grand Forks
O- 993	Duane Gipman	Grand Forks
O- 994	Michael John O'Doherty	Grand Forks
O- 995	Frank John Giordano	Grand Forks
O- 996	Antonius M. Kost	Grand Forks
O- 997	Stanley F. Ruzicka	Grand Forks
O- 998	Richard Kenneth Taylor	Grand Forks
O- 999	Alexander J. Seize	Sparwood
O-1000	Roland W. Riopka	Sparwood
O-1001	Robert J. Wiens	Sparwood
O-1002	Myron J. Zajic	Sparwood
O-1003	Vernon D. Noren	Sparwood
O-1004	Paul Panisiak	Sparwood
O-1005	Thomas G. Bailey	Sparwood
O-1006	Ronald D. Barton	Peachland
O-1007	Kenneth B. Chilton	Peachland
O-1008	John J. Culford	Peachland
O-1009	Bernard W. Cox	Peachland
O-1010	Walter Thiessen	Peachland
O-1011	Barrie E. Fletcher	Peachland
O-1012	Dean Bobocel	Peachland
O-1013	Victor H. Wolfe	Peachland
O-1014	Udo Hennings	Peachland
O-1015	William R. Leeming	Peachland
O-1016	Garston H. Blackwell	Peachland
O-1017	George W. Chadburn	Peachland
O-1018	Noel Collins	Elkford
O-1019	G. Edsel Beharrell	Elkford
O-1020	David John Ekskog	Elkford
O-1021	Joyce M. Chrone	Elkford
O-1022	Donald E. Munroe	Elkford
O-1023	Walter R. Jackson	Elkford
O-1024	Edward Bert Ryckman	Elkford
O-1025	Larry P. Mercier	Elkford
O-1026	Heinz O. Raasch	Elkford
O-1027	Glen Reber	Elkford
O-1028	Allan A. Verishine	Elkford

SURFACE MINE–RESCUE CERTIFICATES, 1974 – *(continued)*

Cert. No.	Name	Where Trained
O-1029	Lyle W. Killoh	Elkford
O-1030	Arthur Ronald McClure	Elkford
O-1031	Francis J. Norgate	Elkford
O-1032	John Berg	Elkford
O-1033	Robert Akira Hamaguchi	Logan Lake
O-1034	Donald James Davis	Sparwood
O-1035	John Patrick Pierce	Sparwood
O-1036	Bob Koenig	Sparwood
O-1037	Chester Friesen	Sparwood
O-1038	William L. Bohn	Elkford
O-1039	Allan Bruce Ackerman	Elkford
O-1040	Ross W. Gibbons	Elkford
O-1041	Ronald G. Brown	Elkford
O-1042	Bruce A. Detoff	Elkford
O-1043	Edward W. Furlinger	Elkford
O-1044	Robert J. Hopple	Elkford
O-1045	John W.A. Scott	Elkford
O-1046	Gordon H. Leduc	Elkford
O-1047	Donald Edward McKay	Elkford
O-1048	Donald A. Dunkley	Elkford
O-1049	David R. Saunders	Elkford
O-1050	Lorne A. De Ross	Elkford
O-1051	J. A. Amano	Elkford
O-1052	Ronald W. Cope	Elkford
O-1053	Leslie V. Forrester	Elkford
O-1054	Cliff J. Emslie	Elkford
O-1055	Donald L. Brooks	Elkford
O-1056	Murrey F. Haight	Elkford
O-1057	John N. Korse	Elkford
O-1058	Larry LeRoy Law	Elkford
O-1059	J. Paul Rainville	Elkford
O-1060	William Allen	Elkford
O-1061	Kevin J. Schreiner	Elkford
O-1062	Byron C. Crotty	Elkford
O-1063	Frederick G. Benthien	Elkford
O-1064	G.W. Dan Jones	Elkford
O-1065	Philip T. Weston	Elkford
O-1066	Alfred C. Kaye	Elkford
O-1067	Ronald J. Duffy	Elkford
O-1068	Sergio H. Peloso	Elkford
O-1069	Donald A. De Ross	Elkford
O-1070	Harry M. Coutts	Elkford
O-1071	Robert Chabbert	Elkford
O-1072	David A. McCarthy	Elkford
O-1073	John P. Gillespie	Elkford
O-1074	Elton E. Boggs	Elkford
O-1075	Ronald J. Malmas	Sparwood
O-1076	Donald K. Sinclair	Sparwood
O-1077	Herbert A. Jobe	Sparwood
O-1078	John Klassen	Sparwood
O-1079	John M. Blackwell	Sparwood
O-1080	Robert A. Deshernais	Sparwood
O-1081	Donald James Holt	Elkford
O-1082	Paul Ganter	Peachland
O-1083	James A. Orr	Peachland
O-1084	Brian J. Doerksen	Peachland
O-1085	Adam Schmidt	Peachland
O-1086	Alexander William Burian	Peachland
O-1087	Lawrence Edwin Depper	Peachland

SURFACE MINE—RESCUE CERTIFICATES, 1974 – *(continued)*

Cert. No.	Name	Where Trained
O-1088	Daniel C. Gismondi	Peachland
O-1089	David J. Pow	Peachland
O-1090	Dale E. Paula	Peachland
O-1091	Donald Davies	Peachland
O-1092	Anton Carl Magnusson	Elkford
O-1093	John W. Snowdon	Elkford
O-1094	Ben Brisson	Elkford
O-1095	Terry P. Durban	Elkford
O-1096	Lucian L. Desautels	Elkford
O-1097	Anthony Clark Austin	Elkford
O-1098	Carl W. Jensen	Elkford
O-1099	Henry A. Davidson	Elkford
O-1100	James S. Lastoh	Elkford
O-1101	Kenneth L. Wildeman	Elkford
O-1102	Andrew Brian Lang	Granisle
O-1103	Clifford Lewis Bartlett	Granisle
O-1104	Maurice Norman Balez	Granisle
O-1105	Roger Louis Johnston	Granisle
O-1106	Michael Joseph Patrick King	Granisle
O-1107	Rockie Barnard Frizzle	Granisle
O-1108	Greg Dwight Martell	Granisle
O-1109	Wallace Rene Cardinal	Granisle
O-1110	Alistair Gordon Harris	Granisle
O-1111	James A. Cahoon	Granisle
O-1112	Richard Cameron	Granisle
O-1113	Mario Bianchini	Corbin
O-1114	Vic A. Caldwell	Corbin
O-1115	Randal O. Widmer	Corbin
O-1116	Patrick J. Harris	Corbin
O-1117	Brian S. Seaman	Corbin
O-1118	Donald Hudgson	Tent Mountain
O-1119	Ronald E. Ostrensky	Tent Mountain
O-1120	Hebert Mitchell	Spillimacheen
O-1121	Andy Yelowega	Sparwood
O-1122	Ronald Cooke LaNeveu	Sparwood
O-1123	Pisci J. Bardocco	Sparwood
O-1124	Paul D. Bourassa	Sparwood
O-1125	John P. Wiebe	Sparwood
O-1126	George E. Bouvier	Sparwood
O-1127	Gordon D. Waage	Sparwood
O-1128	Robert Bruce Francis Haynes	Sparwood
O-1129	Harvey L. Magil	Sparwood
O-1130	Henry Matthews	Sparwood
O-1131	Reinhard Thera	Sparwood
O-1132	Donald J. Waldner	Sparwood
O-1133	Donald R. Leppert	Fernie
O-1134	Jan Julas Fransen	Peachland
O-1135	Charles Kauning	Peachland
O-1136	Brian C. Wilson	Peachland
O-1137	Douglas G. Smith	Peachland
O-1138	Bob G. Malmberg	Peachland
O-1139	David E. Corson	Peachland
O-1140	William Silley	Peachland
O-1141	Raymond G. Paulsen	Peachland
O-1142	Allan Brian Duncan	Peachland
O-1143	Michael M. Klymiuk	Peachland
O-1144	Michael A.S. Jeffery	Granisle
O-1145	John Walter Thorgrimson	Granisle
O-1146	Louis H.C. Tseng	Granisle

SURFACE MINE–RESCUE CERTIFICATES, 1974 – *(continued)*

Cert. No.	Name	Where Trained
O-1147	Trevor William Howell	Granisle
O-1148	David Allan Schroeder	Granisle
O-1149	Timothy William Robillard	Granisle
O-1150	Brian Nicholas Prochnicki	Granisle
O-1151	Charles H.M. Pratt	Granisle
O-1152	James E.A. Lovestrom	Prince George
O-1153	Pat Langley	Prince George
O-1154	John Joseph Shomody	Prince George
O-1155	John Miller	Prince George
O-1156	Terry Carter	Prince George
O-1157	Otto Kedl	Prince George
O-1158	Clare Arnold Hewson	Prince George
O-1159	Elmer Allan Kopetski	Prince George
O-1160	Gary Thomas Cooper	Prince George
O-1161	James E. Yakiwchuk	Prince George
O-1162	Dwight Kitchen	Prince George

GRAVEL PIT MINE–RESCUE CERTIFICATES, 1974

Cert. No.	Name	Where Trained
G-113	Rex L. White	Smithers
G-114	Keith Alexander Johnstone	Houston
G-115	Cecil Imrie	Houston
G-116	Howard Emanuel Pedersen	Houston
G-117	Harold E. Edes	Smithers
G-118	Francis J.R. Martin	Smithers
G-119	Lloyd William Paine	Smithers
G-120	Allen Fred Morgenthaler	Smithers
G-121	Ralph Dupas	Smithers
G-122	John Smith	Smithers
G-123	Rick Leigh Delany	Smithers
G-124	Tom C. Jones, Jr.	Smithers
G-125	James W. Hawkins	Powell River
G-126	Milton G. Johnson	Powell River
G-127	Jake Barg	Maple Ridge
G-128	Gary R. Carr	Maple Ridge
G-129	Albert Dykstra	Maple Ridge
G-130	H. Ken Friesen	Maple Ridge
G-131	Edward D. Friesen	Maple Ridge
G-132	Bradford W. Folka	Maple Ridge
G-133	J. Bruce Hartney	Maple Ridge
G-134	Alas Kenyon	Maple Ridge
G-135	Peter Krahn	Maple Ridge
G-136	John MacAndrew	Maple Ridge
G-137	Andrew McNaughton	Maple Ridge
G-138	Richard H. Purdey	Maple Ridge
G-139	Dennis D. Rabel	Maple Ridge
G-140	Brian T. Stephens	Maple Ridge
G-141	Donald R. Tourand	Maple Ridge
G-142	Kenneth Lyle Worsley	Maple Ridge
G-143	Dave W. Anderson	Nanaimo
G-144	Fred William Barr	Nanaimo
G-145	Wally P. Bilan	Nanaimo
G-146	Ken Cudmore	Nanaimo
G-147	Jacques J. Douglas	Nanaimo
G-148	John Willis Ganderton	Nanaimo
G-149	Alexander Kinghorn	Nanaimo

GRAVEL PIT MINE–RESCUE CERTIFICATES, 1974 – *(continued)*

Cert. No.	Name	Where Trained
G-160	Henry J. Loskey	Nanaimo
G-161	Donald N. Sinclair	Nanaimo
G-162	William M. Smith	Nanaimo

Four mine-safety associations operate in different areas in the Province. They are sponsored by the Department of Mines and Petroleum Resources and the Workers' Compensation Board and are aided by mining company officials, safety supervisors, inspectors of mines, mine-rescue co-ordinators, and, in some areas, local industry. These organizations promote mine-rescue and first-aid training as well as safety education in their various districts.

The West Kootenay Mine Safety Association held its 28th annual competition in Nelson on May 25. There were three mine-rescue teams and 28 first-aid teams. The HB mine, captained by W. B. Abbott, won the mine-rescue competition.

The East Kootenay Mine Safety Association held its 53rd mine-rescue competition in Kimberley with four teams competing. The Sullivan mine team of Cominco Ltd., captained by C. Unruh, won the East Kootenay trophy.

The Central British Columbia Mine Safety Association held its 26th annual competition in Prince George on June 8. The winning team was from the Pinchi Lake mine of Cominco Ltd., and was captained by P. R. Jones.

The Vancouver Island Mine Safety Association held its 60th annual mine-rescue competition June 1 in Nanaimo. The team from Texada Mines Ltd., captained by A. Diggon, won the trophy.

The Provincial Mine Rescue Competition was held in Nanaimo June 15. The Pinchi Lake team, captained by P. R. Jones, won the trophy and went on to compete in the 8th Canadian finals held in Whitehorse, Yukon Territory, June 22. The team from Saskatchewan won the trophy and the Northwest Territories team placed second.

On May 25 a northern surface mine-rescue meet was held in Kamloops. The winning team was from the Gibraltar Mine, captained by R. Young.

On June 1 the southern section of the surface mine-rescue competitions was held at the Harmer Ridge property of Kaiser Resources Ltd. near Sparwood. The Brenda Mines Ltd.'s team, captained by D. Miller, won the trophy. This team also won the Provincial trophy at Craigmont mine near Merritt on September 7.

BRAVERY AWARDS

On September 28, 1973, a miner fell approximately 136 feet down a 52-degree raise at the Pride of Emory mine of Giant Mascot Mines Limited. Mark Cawston, foreman, and Harry Skoglund, superintendent, were soon on the scene, and while they knew there was hung-up ore above which could come down on them, Mr. Cawston and then Mr. Skoglund lowered themselves on ropes and recovered the miner, who unfortunately was dead.

The circumstances surrounding the actions of Messrs. Cawston and Skoglund were investigated by the Workers' Compensation Board and early in 1974 the Board presented Mr. Cawston with the Silver Bravery Award and a cheque for $1,000. Mr. Skoglund was presented the Bronze Bravery Award and a cheque for $500.

JOHN T. RYAN TROPHIES

The John T. Ryan safety trophies were established in 1941 by the Mine Safety Appliances Company of Canada Limited to promote safety in coal and metal mines in Canada. Three Canadian and six regional trophies were established and their administration was given to the Canadian Institute of Mining and Metallurgy.

British Columbia metal mines compete for the British Columbia and Yukon Regional District award as well as for the national metal-mines trophy. The trophies are awarded to the metal-mining company or companies having the least number of compensable accidents per million man-hours of employment recorded. If the million hours cannot be achieved in one year, they may be accumulated over a longer continuous time interval: however, no portion of that period may be used in another application for the same award but can be utilized in application for a higher award. In 1974 the British Columbia and Yukon Regional District award for metal mines was won by Texada Mines Ltd., with an accident frequency of 4.34 per million man-hours. This excellent record enabled them to also win the Canada Award for metalliferous mines, with their entry period extending from 1972 to 1974 inclusive. This same operation won the Canada Award in 1971 with an accident frequency of 4.52 per million man-hours for an entry period extending from 1969 to 1971 inclusive. In effect the accident frequency of this operation for the six-year period has been 4.43 per million man-hours.

The Western Region and Canada Award trophies for coal mines was won by the Michel Colliery of Kaiser Resources Ltd. with an accident frequency of 112.04 per million man-hours.

WEST KOOTENAY MINE SAFETY ASSOCIATION TROPHY

In 1951 the West Kootenay Mine Safety Association donated a safety trophy for annual competition in order to encourage and promote safety in small mines. Entrants were originally restricted to the West Kootenay area, but in 1956 this restriction was removed and entries are accepted from any qualifying mine in the Province.

The award is made to the metal mine having the lowest compensable accident rate and having worked a total of from 2,500 to 30,000 shifts per year, at least one-third of which having been worked underground.

In 1974 the award was won by the Pinchi Lake operation of Cominco Ltd. with an accident frequency of 8.85 per million man-hours of employment recorded.

SAFETY COMPETITION, OPEN-PIT MINES AND QUARRIES

In 1961 the Department of Mines and Petroleum Resources organized a safety competition for the open-pit and quarry industry and instituted awards and donated a trophy for annual competition for operations having the least number of compensable accidents during the year. In 1965, in order to provide a more equitable competition basis, it was decided to donate a second trophy and to divide the entrants having a large number of man-hours into two groups: the A group, for those operations having from 35,000 to 200,000 man-hours per year; and the B group, for those having in excess of 200,000 man-hours per year. A certificate of achievement is awarded to operations amassing 15,000 man-hours without accidents over any continuous time interval.

In 1974 the A trophy was won jointly by four operations each having no compensable or lost-time accidents. The number of accident-free man-hours is indicated in parentheses after the names of the following list of companies winning this award: The Britannia pit of Construction Aggregates Ltd. (138,890); the Texada Island quarry of Canada Cement Lafarge Ltd. (53,845); the Cobble Hill quarry of British Columbia Cement Company Limited (48,409); and the Prince George gravel pit of Ocean Cement Northern Division Limited (37,359).

The Phoenix Copper Division of The Granby Mining Company Limited again won the B trophy with an accident frequency lowered from 9.06 per million man-hours to 3.35 per million man-hours.

In addition to the foregoing operations, certificates of achievement were won by the following with their number of accident-free man-hours listed in parentheses: Dolan's Ltd., Port Alberni (24,184); Kamloops gravel pit, Ocean Cement Northern Division Limited (18,840); and the Kamloops Lafarge quarry operations of Plateau Construction Ltd. (10,982).

MINING ROADS AND TRAILS

Provision is made in the *Department of Mines and Petroleum Resources Act* whereby the Minister may, with the approval of the Lieutenant-Governor in Council, authorize the expenditure of public funds for the construction or repair of roads and trails into mining areas. Assistance on a half-cost basis may also be provided on roads and trails to individual properties.

Requests for road and trail assistance must be made to the Department in an application form provided by the Department before the commencement of work. Assistance given depends upon the type of access, potential of the property, stage of development, and the amount of work to be done. Assistance in the construction and maintenance of trails has virtually disappeared in recent years due to the advent of the helicopter. The helicopter has, to a large extent, made road construction to mineral properties obsolete, especially where damage to the environment is an important consideration.

A carefully drawn sketch or plan of the location of the road is required to be submitted and, where warranted by the amount of assistance requested, a report on the property by a professional engineer may be required. An engineer from the Department may be required to report on the property before a grant is made and to inspect the road after the work has been done.

The total mileages and expenditures under 'Grants in Aid of Mining Roads and Trails' during the 1974/75 fiscal year were as follows:

	Miles	Cost $
ROADS–		
Construction	25.5	175,700.00
Maintenance	381.0	156,321.27
BRIDGES–		
Construction	----	680,035.66
Maintenance	----	28,000.00
Total		1,040,056.93

The main project during 1974 was the construction of a bridge across the Omineca River immediately upstream from the old Omineca bridge which was declared unsafe and beyond repair. This project was completed except for deck installation in 1974. The bridge consists of concrete-filled tubular steel pilings, steel girders, and laminated fir decking.

The Omineca road north of Johanson Lake was up-graded and extended through very difficult terrain. Heavy and continuous rains early in the summer and again in the fall made construction in muskeg areas very difficult and expensive, but this area has now been finished. Some culverts and one 60-foot bridge are required to provide normal road access to the Moosevale Airport north of the Sustut River. The Omineca project provides

access to an area of considerable mineral exploration where there is a potential of several large mines. The Omineca also is an area of great attraction to tourists and sportsmen. A spur road is under consideration to join the Omineca road to the British Columbia Railway via the Sustut River valley.

Assistance to individual property holders was sharply reduced in 1974 since it became apparent that the cost of building the bridge across the Omineca River was far in excess of estimates.

It is expected that the main thrust of effort in the next few years will be to provide improved access to the Omineca exploration area.

PROSPECTORS' ASSISTANCE

The Department of Mines and Petroleum Resources has given financial assistance to prospectors in the Province of British Columbia since 1943. The *Prospectors' Grub-stake Act,* which was in effect from 1943 to 1974, provided up to $500 for travelling, food, clothing, etc., thus giving prospectors an opportunity to carry out independent exploration. Where experienced prospectors planned to prospect in remote areas of the Province, extra travel allowances were made in addition to the normal grub-stake.

In August 1974, the *Prospectors' Grub-stake Act* was repealed and the *Prospectors Assistance Act* was enacted. The new Act makes provision for a minimum grant of $1,000, and a maximum grant of $4,000 per person for one year, and also makes financial assistance available to those who wish to take training which would enable them to qualify for a grant.

Application for assistance was made to P. E. Olson, P. Eng., Director of Prospectors' Assistance, Department of Mines and Petroleum Resources, Victoria.

The *Prospectors Assistance Act* provides for Crown participation in mineral discoveries made by grantees while under grant, whereby the Crown has first right to negotiate with the prospector as a condition of his receiving a grant. There is a further provision for the Crown to explore acquired prospects and for cash bonuses to prospectors when technical surveys or diamond drilling are done on the prospect.

During the summer and fall of 1974, 71 prospectors were in the field, partly under the *Prospectors' Grub-stake Act,* and mainly under the new *Prospectors Assistance Act* with total grants under both acts amounting to $120,000. Under the provision for training assistance, about 200 people took assistance totalling approximately $20,000. Prospecting classes were held in Campbell River, Duncan, Victoria, Vancouver, Kamloops, Smithers, Prince George, Prince Rupert, Nelson, and several other centres, wherein basic prospecting methods were taught.

GRUB–STAKE STATISTICS

Field Season	Approximate Expenditure	Men Grub-staked	Samples and Specimens Received at Departmental Laboratory	Mineral Claims Recorded
	$			
1943	18,500	90	773	87
1944	27,215	105	606	135
1945	27,310	84	448	181
1946	35,200	95	419	162
1947	36,230	91	469	142
1948	35,975	92	443	138
1949	31,175	98	567	103
1950	26,800	78	226	95
1951	19,385	63	255	137
1952	19,083	50	251	95
1953	17,850	41	201	141
1954	19,989	48	336	123
1955	21,169	47	288	183
1956	20,270	47	163	217
1957	22,000	46	174	101
1958	24,850	47	287	211
1959	21,575	38	195	202
1960	28,115	50	358	241
1961	29,175	47	309	325
1962	26,730	52	233	189
1963	29,000	50	150	843
1964	31,751	53	213	351
1965	24,717	42	241	219
1966	26,787	43	224	239
1967	29,891	47	148	432
1968	31,224	47	234	402
1969	21,758	27	151	221
1970	30,614	39	84	423
1971	21,081	23	29	348
1972	20,838	27	64	190
1973	21,146	22	89	47
TOTALS	845,372	1,729	8,628	6,923

PROSPECTORS' ASSISTANCE STATISTICS

Field Season	Approximate Expenditure	People Assisted	Samples and Specimens Received at Departmental Laboratory	Mineral Claims Recorded
	$			
1974	120,000	71	171	166

Personnel from the Government Agents' offices, local mine inspectors, district geologists, and Victoria personnel generously assisted in administering the program.

Prospecting was done in all mining divisions of the Province by grantees during the summer and fall of 1974. Several individuals did geochemical surveys on Vancouver Island, Sechelt, Kamloops, Nelson, Houston, and in the Omineca. Several prospectors were active in the Stikine River, Dease Lake, and Atlin areas, with several new showings being discovered. Many grantees spent the summer and fall working on their own claims, using grant money to do trenching, diamond drilling, sampling, and general prospecting.

As a result of the season's prospecting several properties were brought to the attention of the Department of Mines and Petroleum Resources with a view to the Crown purchasing the deposits of mineral.

RECLAMATION

During the calendar year 1974, 104 reclamation permits were issued and 12 reclamation permits were approved for renewal by the Minister of Mines and Petroleum Resources under authority of section 8 of the *Coal Mines Regulation Act* or section 11 of the *Mines Regulation Act*.

SUMMARY OF RECLAMATION PERMITS ISSUED

Type of Mine	Issued To Date		Issued	Disturbed Land *(acres)*		Bonding	
	1973	1974	1974	1973	1974	1973	1974
Metal mines	46	51	5	18,366	20,500	$1,581,500	$1,712,400
Quarries and gravel	18	69	51	811	1,400	69,800	238,960
Coal mines	3	4	1	3,175	4,120	500,000	618,500
Coal exploration	20	24	4	2,857	3,200	258,500	304,000
Mineral exploration	25	68	43	500	1,200	61,700	129,200
TOTALS	112	216	104	25,709	30,420	$2,471,500	$3,003,060

Considerable work has been done in some mines with actual reclamation of disturbed areas and control tests to determine future types of vegetation. The Bull River mine of Placid Oil Company is the first mine which began production under section 11 of the *Mines Regulation Act* and has ceased production and reclaimed the disturbed area to suitable standards. Kaiser Resources Ltd. has a 2-acre nursery and greenhouse for propagating conifers, deciduous trees, and shrubs; considerable addition is planned for 1975.

AID TO THE SUPERINTENDENT OF BROKERS' OFFICE

A.R.C. James, Senior Inspector of Mines, continued to act as mining engineer advisor to the Superintendent of Brokers' Office, Corporate and Financial Services Division of the Attorney-General's Department. His duties are mainly to advise the Superintendent of Brokers' Office in regard to engineering reports submitted in support of prospectuses by mining companies as required by Regulation 17 under the *Securities Act*. Engineering advice is also required from time to time on certain other matters, such as in connection with programs financed by rights offerings to shareholders, on the assessment of reports of work done on mining properties, on changes of programs or property holdings after a prospectus has been issued, on agreements for sale of mining properties, conditions of option agreements, and in approval of company press releases. W. M. Young, Chief, Geological Division, Petroleum Resources Branch, also assists the Superintendent of Brokers' Office in reviewing reports on petroleum and natural gas properties.

In 1974 a total of 131 reports was reviewed and the Superintendent of Brokers' Office advised on their contents. The reports were submitted by 102 companies, mainly in support of prospectuses.